Galileo Was Wrong
The Church Was Right

The Evidence from Modern Science

Seventh edition

Volume 1

Chapters 1 to 6

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and
Robert J. Bennett, Ph.D.

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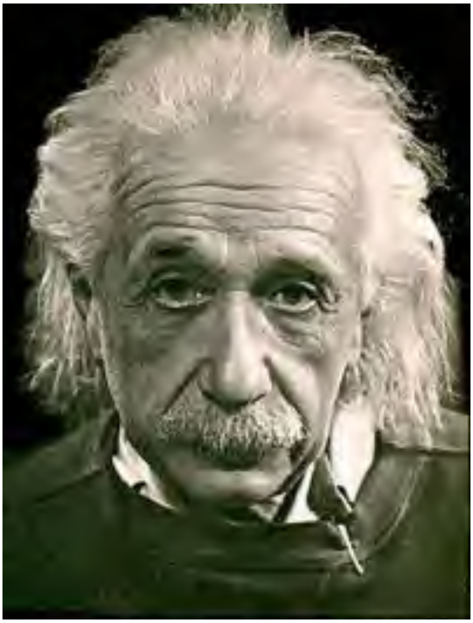
This volume is dedicated to:

Albert Einstein



…who invented Special Relativity to counter experiments revealing that the Earth was motionless in space, which then led him to General Relativity that forced him to accept a motionless Earth as a viable and worthy cosmological system

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About the Authors

Robert A. Sungenis, Ph.D., is the founder of Catholic Apologetics International Publishing, Inc., a non-profit corporation. He holds advanced degrees in Theology and Religious Studies and was a physics major in college. His 700-page doctoral dissertation defended geocentric cosmology from scientific, theological and historical perspectives. He is the author of over twenty books on religion, politics, science and culture. He is also the managing partner of Stellar Motion Pictures, LLC in Los Angeles, which specializes in producing movies on science and religion. He is the executive producer of the recently released movie, *The Principle*. He has appeared on radio and television, including programs on CNN, the BBC and EWTN. He has authored all the chapters and appendices for *Galileo Was Wrong: The Church Was Right: The Evidence from Modern Science*, except for Chapter 10.

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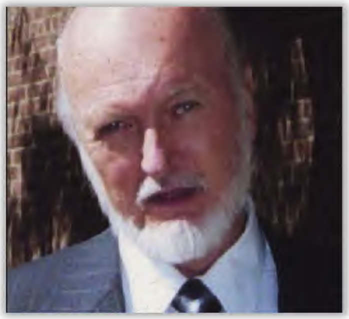

Robert J. Bennett, Ph.D., holds a doctorate in Physics from Stevens Institute of Technology with a thesis on General Relativity titled “Relativistic Rigid Body Motion.” He served as a physics instructor at Manhattan College and Bergen Community College from 1967-1983, and is presently doing private tutoring in physics and mathematics. Dr. Bennett has written Chapter 10, a detailed, technical and mathematical explanation of the various arguments for Geocentrism. He has served as a consultant for the entire *Galileo Was Wrong: The Church Was Right: The Evidence from Modern Science* project.

Endorsements

A truly magnificent work. There exists no better exposition of the history and science of geocentrism. Very highly recommended and a must for all those interested in the issues surrounding geocentrism today. The animations of the CD are excellent. They illustrate the daily and yearly motions of the sun and planets about the earth, the seasons, retrograde motion, and parallax in a uniform way. The authors have done a very admirable job all around. At long last their book provides the solution to all the "dark" fudging and dead-ends in modern Big Bang cosmology – a solution that no one dared voice until an accumulation of evidence over the last two hundred years forced them to do so.

Gerardus Bouw, Ph.D.
Astronomy, Case-Western University, Author of *Geocentricity*

Drs. Sungenis and Bennett make a convincing case for the special and central position of the earth in the cosmos, both physically and spiritually. This is radically at odds from what everyone is taught from childhood; everyone "knows" the earth revolves around the sun. However, from time to time, like the little girl in Andersen's tale *The Emperor's New Clothes*, accepted "wisdom" is challenged; and what everyone "knows" to be true turns out to be merely a concocted fantasy. They make a powerful case that the "truths" of heliocentric and acentric cosmologies aiming to describe the "fabric" of space-time may in fact be constructed out of the same type of "cloth" as the outfit of the Emperor.

Vincent J. Schmithorst, Ph.D., Physics

This book shatters the mythology of the modern mind. Galileo and Einstein go the way of Zeus, as the truth ascends to reclaim man's destiny. It will change the world more dramatically than Copernicus, Galileo, Kepler, Newton and Einstein combined.

Gerald Benitz, M.A., Ph.D. Mathematics/Electrical Engineering

In their book, Robert Sungenis and Robert Bennett have provided an excellent synopsis of a field of science that most people today have probably not even heard about. It is not a regurgitation of some ancient, debunked theory. Neither is this a lightweight paperback, in the vein of so many publications by scientists who have lost the dividing line between science and science fiction. Rather, this book is a work of monumental proportion which ranks, in my opinion, on a par with the meticulous observations of the Danish astronomer, Tycho Brahe, and the tireless efforts of Walter van der Kamp who almost single-handedly raised geocentrism from the ashes in the 1970s and 80s….This book is a scholarly piece of work that should thus be welcomed by any thinking person, and that provides ample food for thought on our place within God's universe."

Neville Thomas Jones, Ph.D. Physics, Imperial College, London

Now that the Enlightenment is over, it was inevitable that the system upon which it was based should come in for the powerful critique which Sungenis and Bennett provide. Not inevitable, however, was the brilliant way they provide it. Their book exposes the ideological underpinnings of the system that failed at the time of the Michelson-Morley experiments, got revived by Einstein, and is still causing mischief today.

E. Michael Jones, Ph.D. History, Temple Univ., Editor: *Culture Wars*

In their book, Sungenis and Bennett examine the 'anomalies' that arise from the Copernican model, anomalies that are swept under the rug by the same scientists who assume the earth is immobile in order to 'simplify' complex problems. A must read for those who can set aside prejudices and a priori assumptions. Human civilization is poised to undergo a colossal multi-faceted shift in perception, philosophy, science and metaphysics that is simply unprecedented in recorded history.

Joseph A. Strada, Ph.D., Aerospace Engineer, NRO

This book forcefully addresses the history, science, theological, philosophical, and worldview implications of our place in the universe. It is virtually a one-volume encyclopedia on geocentrism. After the science has been discussed and the history has been told, it is a powerful reminder of the worldview struggle that faces Christians today.

Russell T. Arndts, Ph.D., Chemistry, L.S.U.

Many works of art and science in the past have been claimed as "game-changers" or "paradigm shifts," only to be revealed later as only superficially different from the status-quo. This book may look like just another "new" and "improved" intellectual product, but it's the real thing.

Thaddeus J. Kozinski, Ph.D. Philosophy,
Wyoming Catholic College

It is with pleasure that I remand this volume into the hands of the reader, whether he or she is an atheistic scoffer, a Roman Catholic inquirer, a Protestant polemicist, an Evangelical skeptic, or is otherwise motivated to re-open an issue heretofore thought, wrongly, to have been settled nearly four centuries ago. This is all the more remarkable, insofar as the present volume exposes the dark, seamy underside of modern science and its Janus-like propensity for speaking out of both sides of its mouth simultaneously.

Martin G. Selbrede, Vice President, The Chalcedon Foundation

This book takes a critical look at the thesis that the Earth is flying through space. Here you will find a thorough review of the scientific observations along with a review of the scientists themselves. You will have the evidence to make up your mind for yourself. Robert Sungenis and Robert Bennett have done a great service to science and to men of good will. Those who see the universe as the handiwork of God need no longer be subservient to fairy tales.

Anonymous, Ph.D. (name withheld by request)
Massachusetts Institute of Technology

This is an amazing work which opened my mind to many things in the field of astronomy and cosmology. I am grateful to Robert Sungenis and his co-author Robert Bennett for this lucid, philosophically powerful and meticulously documented work.

Caryl Johnston, M. Ed., M.L.S.
Jefferson Medical College, Author: *Consecrated Venom*

The very mention that the earth is motionless at the center of the universe, with the sun and universe revolving about it each day, as outlined and defended from physics and astronomy in this book, elicits a profound initial disbelieving shock. This is not a matter of belief but of evidence and of demanding study. Accumulated evidence justifies the rational claim of the text.

John Domen, MS, Physics, Massachusetts Institute of Technology

From Quasars to Gamma-Ray Bursts, from Parallax to Red Shifts, and from Michelson-Morley to Sagnac, Drs. Sungenis and Bennett's book meticulously applies the scientific mortar to the theological bricks of geocentrism, producing a compelling structure that brings Catholic teaching and modern science to a crossroads. If the Earth is really the center of the universe, then modern man must face his biggest fear – that there is a Creator who put it there, and man is subject to His rule and authority.

John Salza, Esquire, Author: *Masonry Unmasked*

Notice Concerning Terminology and Physics

This book is written for both layman and scientist. The main text of the book seeks to explain the scientific information in a simple and entertaining way. The footnotes contain the technical information and sources for the scientist and scholar. We employ the term “geocentrism” to represent the scientific position that the Earth is motionless in space at the center of the universe with neither diurnal rotation nor translational movement. We have adopted the term “heliocentrism” to represent the views of Copernicus, Galileo, Kepler, Newton, even though there are various differences among them, including the acentrism of Einstein. Others employ “geocentricity” or “geostatism” to represent the motionless Earth, and employ “geokineticism” or “antigeostatism” to represent a moving Earth. The term “geocentrism” will stand for any scientific theory that holds the Earth is the center of the universe and/or motionless in space. The term “heliocentrism” will stand for any scientific theory that holds that the Earth is not in the center, or that the sun is the center, or that there is no center of the universe, and that the Earth is in constant motion. In addition to the above, we have adopted the spelling “ether” rather than “aether,” since most scientific texts have employed the former. We have adopted to capitalize titles such as Special Relativity, General Relativity, Quantum Mechanics, the Big Bang, String Theory, etc., in order to emphasize that a particular but controversial theory is being discussed. The word “Earth” has been consistently capitalized in distinction to “sun,” “moon,” “stars” or “universe” which have been left in the lower case. The cosmic microwave background radiation is abbreviated with the acronym “CMB.” So as to limit the confusion often inherent in the words rotation and revolution, these volumes use word “rotation” to refer to the turning of an object upon its own axis, including the turn of the entire universe around the north-south axis of the Earth; whereas “revolution” refers to the angular movement of one object around another wherein both are separated by space, as in saying “Mercury revolves around the sun.”

We make use of Newtonian, Machian, Lorentzian, Einsteinian, Quantum, LCDM (Big Bang) and other mathematical systems of physics but do not endorse any of them as having the correct physical representation of reality. We use these models to demonstrate that the geocentric universe can be substantiated by one or more of these models, but that none of them can provide the correct physical model of the universe. At times we will demonstrate how their limited view of reality has been used to obscure geocentric cosmology from the public, and at other times show how the logical conclusions of their own systems supports geocentric cosmology.

"All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident."

Arthur Schopenhauer[1]

"Scientists...are used to dealing with doubt and uncertainty. All scientific knowledge is uncertain....Science alone of all the subjects contains within itself the lesson of the danger of belief in the infallibility of the greatest teachers in the preceeding generation....Learn from science that you must doubt the experts…Science is the belief in the ignorance of experts."

Richard Feynman[2]

"Sometimes the first obligation of intelligent men is to restate the obvious."

George Orwell[3]

"Many people believe they are thinking when they are only rearranging their pre-existing prejudices."

Martin Selbrede[4]

"The Copernican revolution outshines everything since the rise of Christianity and reduces the Renaissance and Reformation to the rank of mere episodes."

Herbert Butterfield[5]

"The fool on the hill sees the sun going down and the eyes in his head see the world spinning round."

Lennon and McCartney[6]

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[1] Attributed, not verified.

[2] Richard, Feynman, *The Meaning of it All: Thoughts of a Citizen Scientist*, 1998, p. 26; Feynman, *The Pleasure of Finding Things Out*, 1999, p. 188; *ibid*., p. 187.

[3] Attributed, not verified.

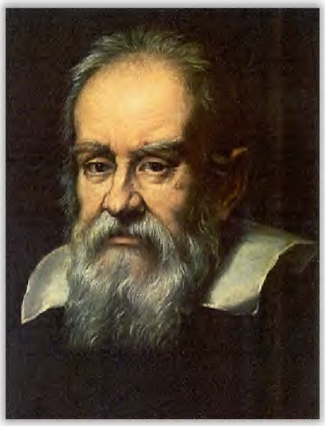
[4] Interview for the scientific documentary, *The Principle*, 2012.

[5] Owen Barfield, *Saving the Appearances: A Study in Idolatry*, 2nd edition, Wesleyan University Press, 1988, pp. 50-51.

[6] From the song, *The Fool on the Hill*, recorded 1967.

Introduction

This book, *Galileo Was Wrong: The Church Was Right: The Evidence from Modern Science*, will, at the least, be viewed as an unusual book by the world at large. In modern times, everyone is taught from early childhood through old age that the Earth rotates on its axis and revolves around the sun. It is considered a bedrock of truth so firmly established that only the insane or perhaps members of the Flat Earth Society, would doubt or question so sanctified a truth of modern man.



Galileo Galilei
1564 – 1642

Unbeknownst to almost the entire human race, however, is the fact that no one in all of history has ever *proven* that the Earth moves in space. Despite his protestations to the contrary, the historical record reveals that **Galileo Galilei** had no proof for his controversial assertions. What he purported as proof in his day would be laughed out of science classrooms today. Galileo merely began a myth, a myth that eventually took on a life of its own and became the *status quo* of popular thinking.

But this is not merely Galileo's burden. In fact, as we will see in Chapter 1, a year before he died Galileo renounced, quite dramatically, all his claims that the Earth went around the sun – a fact of history which has been kept well under wraps by the reigning powers of academia. The burden is now on modern science, since some three hundred years after Galileo, like him, it has also deprived us of proof that the Earth moves. As one honest scientist put it in a book endorsed by Einstein: "…nor has any physical experiment ever proved that the Earth actually is in motion."[7] Modern scientists freely admit that heliocentrism is merely the *preferred* model of cosmology, and the choice to believe it is made purely on philosophical grounds, not scientific ones. Although various scientists and historians have certainly made it *appear* as if many and varied proofs exist for heliocentrism, and thereby they have convinced a rather naïve public, in reality, modern science is actually covering up the fact that it has no proof for its cherished view of cosmology.

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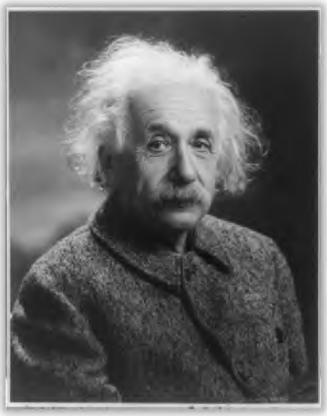
[7] Lincoln Barnett, *The Universe and Dr. Einstein*, p. 73.

As **Albert Einstein** himself once admitted, reliance on the doctrine of Copernicus is not nearly as strong as we were once led to believe:



> Since the time of Copernicus we have known that the Earth rotates on its axis and moves around the sun. Even this simple idea, so clear to everyone, was not left untouched by the advance of science. But let us leave this question for the time being and accept Copernicus' point of view.[8]

Stephen Hawking, the next most famous physicist after Einstein, said something very similar:

> So which is real, the Ptolemaic or the Copernican system? Although it is not uncommon for people to say that Copernicus proved Ptolemy wrong, that is not true. As in the case of our normal view versus that of the goldfish, one can use either picture as a model of the universe, for our observations of the heavens can be explained by assuming either the earth or the sun to be at rest.[9]

---

[8] Albert Einstein and Leopold Infeld, *The Evolution of Physics*, 1938, 1966, pp. 154-155. Thus, Einstein could say: "The four men who laid the foundation of physics on which I have been able to construct my theory are Galileo, Newton, Maxwell, and Lorentz" ("Einstein, too, is Puzzled; It's at Public Interest," *Chicago Tribune*, April 24, 1921, p. 6).

[9] *The Grand Design*, Stephen Hawking and Leonard Mlodinow, 2010, pp. 41-42. Hawking adds: "Despite its role in philosophical debates over the nature of our universe, the real advantage of the Copernican system is simply that the equations of motion are much simpler in the frame of reference in which the sun is at rest." Hawking is referring to Ptolemy's epicycles and equants. As we will see later, however, Ptolemy was seeking to account for the real motions of the planets as opposed to mere circular orbits. Copernicus desired to keep Aristotle's circular orbits but later was forced to add his own epicycles to account for the actual

Modern science has, indeed, been very happy to follow Einstein's prescription to "accept Copernicus' point of view" even though it has been made very clear that "the advance of science" has revealed it is an unprovable assumption. As one of Einstein's staunch supporters and a much admired physicist in his own right, Sir Arthur Eddington, admitted about the question:

> Which is right?....Or are both the victims of illusion?....No one knows which is right. No one will ever know, because we can never find out which, if either, is truly at rest in the aether….The bulge of the Earth's equator may be attributed indifferently to the Earth's rotation or to the outward pull of the centrifugal force introduced when the Earth is regarded as non-rotating.[10]

Arthur Eddington
1882-1944

A very famous experiment took place in 1887 to answer the above question – the Michelson-Morley experiment. The results were shocking to say the least. Based on the then current science, the experiment demonstrated the Earth wasn't moving through space. In a book endorsed by Einstein, theoretical physicist James Coleman admitted:

> ….The easiest explanation was that the earth was fixed in the ether and that everything else in the universe moved with respect to the earth and the ether….Such an idea was not considered seriously, since it would mean in effect that our earth occupied the omnipotent position in the universe, with all the other heavenly bodies paying homage by moving around it.[11]

Lincoln Barnett says much the same:

> The Michelson-Morley experiment confronted scientists with an embarrassing alternative. On the one hand they could scrap the ether theory which had explained so many things about

---

motion of the planets, and thus his system was not "much simpler" than Ptolemy's.

[10] *Space, Time and Gravitation*: *An Outline of the General Relativity Theory*, 1923, pp. 24, 41. Eddington adds: "Some would cut the knot by denying the aether altogether. We do not consider that desirable" (*ibid*., p. 39).

[11] James A. Coleman, *Relativity for the Layman*, p. 37. Of Coleman's book Einstein wrote: "Gives a really clear idea of relativity" (front cover 1954 edition).

> electricity, magnetism, and light. Or if they insisted on retaining the ether they had to abandon the still more venerable Copernican theory that the earth is in motion. To many physicists it seemed almost easier to believe that the earth stood still than that waves – light waves, electromagnetic waves – could exist without a medium to sustain them. It was a serious dilemma and one that split scientific thought for a quarter century. Many new hypotheses were advanced and rejected. The experiment was tried again by Morley and by others, with the same conclusion; the apparent velocity of the earth through the ether was zero.[12]

After a quarter century of turmoil, a choice had to be made. Either mankind could retain its then present knowledge of physics but admit the Earth was motionless in space, or it could reinvent physics with all new concepts and formulas to keep the Earth moving. Needless to say, the latter option was chosen. The one to lead them in this new venture was Albert Einstein. In a word, Einstein was forced to turn science upside down in order to keep Copernicus enshrined in the hearts of men. In turn, Einstein's supporters have followed him and his theories with almost godlike devotion, developing what is, for lack of a better term, the 'cult of Einstein.' As his major biographer said it:

> A new man appears abruptly, the 'suddenly famous Doctor Einstein.' He carries the message of a new order in the universe. He is a new Moses come down from the mountain to bring the law and a new Joshua controlling the motion of heavenly bodies….The new man who appears at that time represents order and power. He becomes the θεῖος ἀνήρ, the divine man, of the twentieth century.[13]

The reality is quite different, however. The theory of Relativity, by its very nature, brings Copernican cosmology under great suspicion and ultimately forces it into becoming just one perspective among others. By design, these stark implications of Relativity theory have been systematically ignored and the science community has decided to "leave this question for the time being" hoping that few people will be bold enough to follow the implications to their logical conclusion and ask, indeed, what right mankind has to "accept Copernicus' point of view." It is just a matter of time before books and articles like the one you are reading will begin to reveal this information to the public. Up until now almost all of it has been hidden from their eyes. Little is revealed at the university level, and virtually none of it has been divulged in the secondary curriculum, and we certainly haven't read it on the pages of *Time* or *USA Today*, except perhaps for the occasional ridiculing of "fundamentalists" and their offshoots for even broaching such subjects. There is a good reason why such reticence exists – there is simply too much at stake. The mere thought of having to tell the world that it might have to turn back the clock and admit that science took a wrong turn when it accepted the Copernican theory as a scientific fact is, as Einstein's biographer once put it, "unthinkable."[14]

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[12] Lincoln Barnett, *The Universe and Dr. Einstein*, p. 44.

[13] Abraham Pais, *Subtle is the Lord*, 1982, 2005, p. 311. The phrase θεῖος ἀνήρ is the Greek for "divine man." As another physicist put it: "Too often students believe that Moses, or rather Newton or Einstein, came down from a physical Mt. Sinai with his laws engraved on tablets of stone" (Ronald Newburgh, "Inertial forces, absolute space, and Mach's principle: The genesis of relativity," *American Journal of Physics*, 75(5), May 2007, p. 427).

We can sympathize with their plight. Think of the sheer embarrassment modern science would face if it were forced to apologize for 500 years of propagating one of the biggest blunders since the dawn of time. This is not the Middle Ages, a time in which mistakes can be excused due to primitive scientific tools and superstitious notions. This is the era of Newton, Maxwell, Faraday, Darwin, Einstein, Edison, Planck, Hubble, Hawking, and scores of other heroes of science. If Copernicus is wrong, how could modern science ever face the world again? How could it ever hold to the legacy left by these scientific giants if it were forced to admit it was wrong about one of its most sacrosanct and fundamental beliefs? Admitting such a possibility would put question marks around every discovery, every theory, every scientific career, and every university curriculum. The very foundations of modern life would crumble before their eyes. Not only would Earth literally become immobile, but it would figuratively come to a halt as well, for men would be required to revamp their whole view of the universe, and consider the most frightening reality of all – that a supreme Creator actually *did* put our tiny globe in the most prestigious place in the universe, since only fools would dare to conclude that Earth could occupy the center of the universe by chance. Most of all, science would be compelled to hand the reins of power and influence back to the Church and to Scripture, since it is from these sources alone that the teaching of a motionless Earth originated.

Although we can all agree that modern science certainly has more sophisticated instruments today that allows it to gather thousands of bits of data about the universe, the problem is that scientists are at a loss how to interpret that information correctly and put it into a coherent and comprehensive understanding of the universe. Knowledge is plentiful, but wisdom is severely lacking. As one astronomer admitted: "Perhaps it is time for astronomers to pause and wonder whether they know too much and understand too little."[15] Hence, the first two volumes of *Galileo Was Wrong: The Church Was Right* will be devoted mainly to the scientific evidence concerning cosmology. Since modern science has made itself into such an imposing authority on the minds of men today, no study of this kind could possibly be adequate until the scientific assertions are thoroughly addressed and rebutted. We have compiled the most comprehensive scientific treatise on the issue ever offered to the public. The third volume will be devoted mainly to the scriptural, ecclesiastical and patristic evidence supporting the cosmology of geocentrism. We only ask that you, the reader, contemplate the issue with an open mind. All too often when controversial subjects of this nature arise, those who wish to protect the *status quo* are quick to demonize their opponents, choosing instead to associate them with such institutions as the "Flat earth society," or characterize them as geeks who don tinfoil hats and receive messages from outer space. Hopefully, you will not fall into that trap of bigotry and censorship. Rest assured, the authors of this book do not fill any of the above caricatures, but are dedicated solely to the cause of truth, both scientific and theological, and will seek to do their task in the face of any opposition.

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[14] Ronald Clark, *Einstein: The Life and Times*, 1984, p. 110.

The world today has lost sight of its purpose for existence. Corruption, apathy and decadence have penetrated almost every level of society. Consequently, the human soul desperately needs a refresher course on the meaning of life. Only a few have realized what a large part Copernicanism has played in the overall deterioration of society. The poet Johann von Goethe once wrote:

> But among all the discoveries and corrections probably none has resulted in a deeper influence on the human spirit than the doctrine of Copernicus…. Possibly mankind has never been demanded to do more, for considering all that went up in smoke as a result of realizing this change: a second Paradise, a world of innocence, poetry and piety: the witness of the senses, the conviction of a poetical and religious faith. No wonder his contemporaries did not wish to let all this go and offered every possible resistance to a doctrine which in its converts authorized

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[15] Herbert Friedman, *The Amazing Universe*, National Geographic, 1975, p. 180.

> and demanded a freedom of view and greatness of thought so far unknown indeed not even dreamed of."[16]

Barring a conversion to geocentric cosmology, our modest goal is, whoever reads these volumes will not leave without realizing that what he has been taught about the Earth's annual journey around the sun is not so certain after all, and that similar to the rationale for deciding verdicts in a court of law, one should realize that there is enough evidence supporting geocentrism to cause a reasonable doubt in the minds of intelligent people. As even one of the leading science magazines recently stated: "When an author puts himself on the line by embracing an unfashionable idea, even though he is guaranteed to generate scorn or indifference, this should somehow be recognized" (*Discover*, December 2006).

Robert Sungenis
December 2012

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[16] Zur Farbenlehre, Materialien zur Geschichte der Farbenlehre, Frankfurt am Main, 1991, Seite 666.

For it is He who gave me unerring knowledge
of what exists, to know the structure of the world
and the activity of the elements;
the beginning and end and middle of times,
the alternations of the solstices
and the changes of the seasons,
the cycles of the year
and the constellations of the stars…
I learned both what is secret and what is manifest,
for wisdom, the fashioner of all things, taught me.

Wisdom 7:17-19, 21

"I have come to believe that the motion of the Earth cannot be detected by any optical experiment."

Albert Einstein[17]

"…to the question whether or not the motion of the Earth in space can be made perceptible in terrestrial experiments. We have already remarked…that all attempts of this nature led to a negative result. Before the theory of relativity was put forward, it was difficult to become reconciled to this negative result."

Albert Einstein[18]

"Briefly, everything occurs as if the Earth were at rest…"

Henrick Lorentz[19]

"There was just one alternative; the earth's true velocity through space might happen to have been nil." Arthur Eddington[20]

"The failure of the many attempts to measure terrestrially any effects of the earth's motion…" Wolfgang Pauli[21]

"We do not have and cannot have any means of discovering whether or not we are carried along in a uniform motion of translation."

Henri Poincaré[22]

"A great deal of research has been carried out concerning the influence of the Earth's movement. The results were always negative."

Henri Poincaré[23]

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[17] Speech titled: "How I Created the Theory of Relativity," delivered at Kyoto University, Japan, Dec. 14, 1922, as cited in *Physics Today*, August, 1982.

[18] "Relativity – The Special and General Theory," cited in Stephen Hawking's, *A Stubbornly Persistent Illusion*, 2007, p. 169.

[19] Lorentz's 1886 paper, "On the Influence of the Earth's Motion of Luminiferous Phenomena," in A. Miller's *Albert Einstein's Special Theory of Relativity*, p. 20.

[20] Arthur Eddington, *The Nature of the Physical World*, 1929, pp. 11, 8.

[21] Wolfgang Pauli, *The Theory of Relativity*, 1958, p. 4.

[22] From Poincaré's lecture titled: "L'état actuel et l'avenir de la physique mathematique," St. Louis, Sept. 24, 1904, *Scientific Monthly*, April, 1956.

[23] From Poincaré's report *La science et l'hypothèse* ("Science and Hypothesis")1901, 1968, p. 182. L. Kostro's, *Einstein and the Ether*, 2000, p. 30.

"This conclusion directly contradicts the explanation…which presupposes that the Earth moves."

Albert Michelson[24]

"The data were almost unbelievable... There was only one other possible conclusion to draw — that the Earth was at rest."

Bernard Jaffe[25]

"…nor has any physical experiment ever proved that the Earth actually is in motion."

Lincoln Barnett[26]

"Thus, even now, three and a half centuries after Galileo…it is still remarkably difficult to say categorically whether the earth moves..."

Julian B. Barbour[27]

"*…there must be no favored location in the universe, no center, no boundary; all must see the universe alike. And, in order to ensure this situation, the cosmologist postulates spatial isotropy and spatial homogeneity….*"

Edwin Hubble[28]

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[24] Albert A. Michelson, "The Relative Motion of the Earth and the Luminiferous Ether," *American Journal of Science*, Vol. 22, August 1881, p. 125, said after his interferometer experiment did not detect the movement of ether against the Earth.

[25] Bernard Jaffe, *Michelson and the Speed of Light*, 1960, p. 76. Jaffe adds this conclusion to the above sentence: "This, of course, was preposterous."

[26] Lincoln Barnett, *The Universe and Dr. Einstein*, 2nd rev. edition, 1957, p. 73.

[27] Julian Barbour, *Absolute or Relative Motion*, Cambridge University Press, 1989, p. 226.

[28] Edwin Hubble, *The Observational Approach to Cosmology*, 1937, p. 63.

Chapter 1

The New Galileo & the Truth about Copernicanism

Galileo was wrong?! How could modern men from the twenty-first century dare to name a book with such a title? No doubt, almost every book written about cosmology in modern times begins with the premise that Copernicus' and Galileo's cosmology was correct and the Catholic Church that condemned them was very mistaken. Typical remarks in a book about Galileo begin with very stern and foreboding words. The reader is simply not permitted to entertain any other possibility as to the construction and movements of the cosmos. As one author put it: "Galileo…who produced *the irrefutable proofs of the Sun-centered system*…came into direct and disastrous conflict with the Church."[29] Another says: "Readers, who know quite well that the Earth goes around the sun…"[30] Yet another says:

> Who better than Galileo to propound the most stunning reversal in perception ever to have jarred intelligent thought: We are not the center of the universe. The immobility of our world is an illusion. We spin. We speed through space. We circle the Sun. We live on a wandering star.[31]

The reader, not knowing any differently, doesn't give the author's assertion a second thought for all his life he has been taught that the Earth revolves around the sun, and he has placed himself under the edict that this particular teaching of modern science is no more to be doubted than the fact that fish swim or that birds fly.

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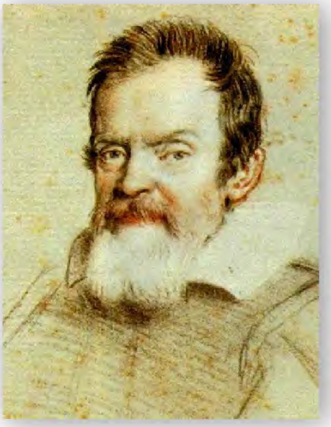
[29] Ivan R. King, *The Unfolding Universe*, 1976, p. 132, emphasis added. Ivan King was professor of astronomy at the University of California, Berkeley.

[30] Giorgio de Santillana, Massachusetts Institute of Technology, *The Crime of Galileo*, 1962, editor's preface, pp. viii-ix. De Santillana's major thesis is stated very early in the book: "…the tragedy was the result of a plot of which the hierarchies themselves turned out to be the victims no less than Galileo – an intrigue engineered by a group of obscure and disparate characters in strange collusion who planted false documents in the file, who later misinformed the Pope and then presented to him a misleading account of the trial for decision" (p. xx). Suffice it to say, our book will show that it is Santillana who has been the victim of an intrigue engineered by a group of prominent and influential scientists in collusion, who made false conclusions from scientific experiments and then presented a misleading account to the public.

[31] Dava Sobel, *Galileo's Daughter*, 1999, p. 153.

As the typical author begins from the unquestioned premise that Galileo's sun-centered world has been indisputably proven, he will postulate various reasons why the Catholic Church did not accept this new and improved model of the universe. The suggestions are many and varied, ranging from "ecclesiastical bureaucracy," "deliberate chicanery," "religious fundamentalism," "corporate interests" to "unfair tactics,"[32] but there is little doubt that virtually all the biographers and historians will invariably dismiss the possibility that Galileo could have been wrong.



Galileo Galilei: 1564 – 1642

Galileo's Conversion to Geocentrism

Although it will certainly come as a shock to most people, one very important reason we argue against heliocentrism is that we are revealing the wishes of none other than Galileo himself.[33] Unbeknownst to almost every modern reader, and even most historians, is the fact that just one year prior to his death Galileo made it very clear to his former allies where he now stood on the subject of cosmology. On the 29th of March 1641,

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[32] These are some of the various reasons given for the Church's rejection of Galileo's theory in the opening pages of Giorgio Santillana's *The Crime of Galileo* (pp. ix, xv, xx), a very terse and satirically worded account of the Galileo affair which is highly critical of the Catholic Church's role and very favorable to Galileo.

[33] Galileo Galilei was also Latinized to Galileus Galileus, which was often the way Galileo signed his name, as for example in his exchange of letters with Kelper in 1597. He was also called Galileo Galilei Linceo.

Galileo responded to a letter that he received from his colleague Francesco Rinuccini, dated the 23rd of March 1641, containing discoveries made by the astronomer Giovanni Pieroni concerning the parallax motion of certain stars, from which both Rinuccini and Pieroni believed they had uncovered proof of the heliocentric system. Rinuccini writes to Galileo:

> Your Illustrious Excellency, Signor Giovanni Pieroni has written to me in recent months telling how he had clearly observed with an optical instrument the movement of a few minutes or seconds in the fixed stars, but with just that level of certainty that the human eye can attain in observing a degree. All this afforded me the greatest pleasure - witnessing such a conclusive argument for the validity of the Copernican system! However, I have felt no little confusion because of something I read a few days ago in a bookshop. I happened to look at a book that is just now on the verge of being published. According to the author, if it were true that the sun is the center of the universe, and that the Earth travels around it once every year, it would follow that we would never be able to see half of the whole sky by night, because the line passing through the center and the horizons of the Earth, touching the periphery of the great orb, is a cord of a piece of the arc of the circle of the starry heavens, the diameter of which passes through the center of the sun. And since I have always believed it to be true - not having personally witnessed it - that the first [star] of Libra rises at the same moment as the first [star] of Aries sets, my limited intelligence has been unable to arrive at a solution. I therefore implore you, in your very great kindness, to remove this doubt from my mind. I will be very greatly obliged to you. Reverently kissing your hand, etc. Francesco Rinuccini."[34]

Galileo, not being particularly moved by the assertions, writes this surprising response to Rinuccini:

> The falsity of the Copernican system should not in any way be called into question, above all, not by Catholics, since we have the unshakeable authority of the Sacred Scripture, interpreted by the most erudite theologians, whose consensus gives us certainty

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[34] *Le Opere Di Galileo Galilei*, Antonio Favaro, reprinted from the 1890-1909 edition by Firenze, G. Barbèra – Editore, 1968, vol. 18, p. 311, translated from the original Italian by Fr. Brian Harrison.

> regarding the stability of the Earth, situated in the center, and the motion of the sun around the Earth. The conjectures employed by Copernicus and his followers in maintaining the contrary thesis are all sufficiently rebutted by that most solid argument deriving from the omnipotence of God. He is able to bring about in different ways, indeed, in an infinite number of ways, things that, according to our opinion and observation, appear to happen in one particular way. We should not seek to shorten the hand of God and boldly insist on something beyond the limits of our competence…. D'Arcetri, March 29, 1641. I am writing the enclosed letter to Rev. Fr. Fulgenzio, from whom I have heard no news lately. I entrust it to Your Excellency to kindly make sure he receives it."[35]

Io Galileo Galilej mano pp:

Search as one might, few today will find Galileo's retraction of Copernicanism cited in books or articles written on the subject of his life and work. Fewer still are those in public conversation about Galileo who have ever heard that he recanted his earlier view. The reason is, quite simply, that the letter has been obscured from the public's eye for the last four centuries. As Galileo historian Klaus Fischer has admitted: "The ruling historiographers of science cannot be freed from the reproach that they have read Galileo's writings too selectively."[36] Fortunately, Galileo's retraction managed to escape censorship and find its way among the rest of his letters in the twenty-volume compendium *Le Opere di Galileo Galilei* finally published in 1909 with a reprint in Florence in 1968. Centuries prior to its publication, there was a concerted effort by either Rinuccini or someone behind the scenes to cover up the fact that the letter was, indeed, written and sent by Galileo. We know this to be the case since a rather obvious attempt was made to erase Galileo's name as the signatory of the letter. The compiler of the original letter makes this startling notation: "The signature 'Galileo Galilei' has been very deliberately and repeatedly rubbed over, with the manifest intention of rendering it illegible."[37] Stillman Drake, one of the top Galileo historians, noticed the subterfuge:

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[35] *Ibid*, p. 316, translated from the original Italian by Fr. Brian Harrison. A note added by the editor states: "Bibl. Naz. Fir. Banco Rari, Armadio 9, Cartella 5, 33. – Orginale, di mano di Vincenzio Vivani." This means that the letter is stored in the rare archives of the National Library at Florence in the rare books department, in cabinet #9, folder #5, 33 and written in the original hand of Vincenzio Viviani, since Galileo was blind in both eyes in 1641. Viviani was Galileo's last pupil and first biographer. NB: Viviani had performed the first Foucault-type pendulum experiment in 1661. Galileo's letter to Rinuccini was translated into English by Fr. Brian Harrison upon request. Stillman Drake contains a similar translation in *Galileo At Work: His Scientific Biography*, 1978, p. 417.

[36] Klaus Fischer, *Galileo Galilei*, Munich, Germany, Beck, 1983, p. 114.

> Among all Galileo's surviving letters, it is only this one on which his name at the end was scratched out heavily in ink. I presume that Rinuccini valued and preserved Galileo's letters no matter what they said, but did not want others to see this declaration by Galileo that the Copernican system was false, lest he be thought a hypocrite.[38]

Judging from the contents of his letter to Rinuccini, for quite some time it seems that Galileo had been contemplating the problems inherent in the Copernican system, as well as his desire to convert back to an Earth-centered cosmology. The wording in his letter is rather settled and direct as it does not reflect someone who is confused or equivocating. It holds the convictions of a man who has been swept off his feet by a more convincing position. Hence, far from being a hero of modern cosmology, shortly before his death Galileo had become its worst adversary – a fact of history that has been either quietly ignored or deliberately suppressed.

What has also been suppressed is the spiritual reason Galileo had a change of heart. In the new book *Galileo: Watcher of the Skies*, author David Wootton makes a substantial case that prior to 1639, three years before his death, Galileo was not a true Christian but merely a nominal Catholic who was a member of a secret society that actually rejected major Catholic doctrines. These doctrinal aberrations, coupled with his immoral life, strongly suggest that Galileo's quest to advance Copernicanism was motivated by a very strong anti-Church sentiment, as was the case with many other scientists in history. By 1641, it seems to be the case that Galileo's newfound faith led him to accept fully the Church's historic geocentric cosmology as a divine revelation.[39]

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[37] Original Italian: "La firma 'Galileo Galilei' è stata accuratissimamente coperta di freghi, con manifesta intenzione di renderla illeggibile" (*Le Opere Di Galileo Galilei*, vol. 18, p. 316, footnote #2). Translated by Fr. Brian Harrison.

[38] Stillman Drake, *Galileo At Work: His Scientific Biography*, 1978, p. 418.

[39] See Volume III, Chapter 16 for the details of Galileo's conversion. David Wootton, *Galieo: Watcher of the Skies*, New Haven, Yale Univ. Press, 2010.

Copernicanism's Procrustean Bed

Opposed to the repentant and converted Galileo, most of today's scientists impose on us a belief, according to Carl Sagan (d. 1996), that "we live on an insignificant planet of a humdrum star lost in a galaxy tucked away in some forgotten corner of a universe in which there are far more galaxies than people," and all of which popped into existence, by chance, "billions and billions" of years ago.[40]

Carl Sagan
1934 – 1996

Stephen Gould
1941 – 2002

This glum picture of our place in the universe is, in the estimation of its most cherished icons, the springboard of all modern science. In the words of one of its leading figures, Stephen Jay Gould:

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[40] Carl Sagan, *Cosmos*, New York: Random House, 1980, p. 193. "The Cosmos is all that is or ever was or ever will be. Our feeblest contemplations of the Cosmos stir us — there is a tingling in the spine, a catch in the voice, a faint sensation of a distant memory, as if we were falling from a great height. We know we are approaching the greatest of mysteries" (*ibid.*, p. 4). "The idea that God is an oversized white male with a flowing beard who sits in the sky and tallies the fall of every sparrow is ludicrous. But if by God one means the set of physical laws that govern the universe, then clearly there is such a God. This God is emotionally unsatisfying... it does not make much sense to pray to the law of gravity" ("Scientists & Their Gods," *U.S. News & World Report* Vol. 111 (1991); "Who is more humble? The scientist who looks at the universe with an open mind and accepts whatever it has to teach us, or somebody who says everything in this book must be considered the literal truth and never mind the fallibility of all the human beings involved?" Interview with Charlie Rose (1996).

overturn Fizeau and Airy's findings, but as noted above, it failed to do so.[737]

Einstein's biographer probably didn't even know this history when he wrote that men were faced with the possibility of "scuttling the whole Copernican theory" after the Michelson-Morley experiment. Unlike Einstein, most such biographers have fixated on the cart but were rather oblivious to the horse. All in all, we can say this much for Einstein: although his theories were certainly fantastic to the point of absurdity, at least he was smart enough to know from whence his opposition came. In the battle for the cosmos, the unexpected results of the Fizeau and Airy experiments had already put modern science on trial, but since they both produced anti-Copernican results, the clarion call of concern was not being trumpeted to the rest of the world. For the rest of his career Einstein would do everything in his power to stop it from sounding. As van der Kamp has stated: "Yes, I think I understand the sentiment motivating him. If we cannot prove what we *a priori* 'know' to be true [a moving Earth], then we have to find a reason why such a proof eludes us."[738] And thus was born the theory of Relativity.

When one reads Einstein's works, there appears to be no ostensible concern that these experiments could "scuttle the whole Copernican theory," nevertheless, there is an undercurrent in his writings that he is indeed cognizant of such implications yet does his best not to alarm the world. Even in private his concerns are subtle. For example, in an exchange with Willem de Sitter in 1917 over whether the universe was a "3-dimensional hypersphere embedded in a 4-dimentional Euclidean space" or a "4-dimensional hypersphere embedded in a 5-dimensional Euclidean space," Einstein objected to de Sitter's 4-5 model based mainly on the fact that it had "*a preferred center*."[739]

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[737] As physicist Herbert Ives reminds us: "It must not be forgotten in the discussion of this subject that the Michelson-Morley experiment…only demands invariance of light signals with the velocity of the moving platform of measurement *on the premise that the Earth is moving* – there is no other motion involved in the experiment. If this is not agreed to then the null result proves nothing with regard to invariance, and the whole discussion is futile" ("Light Signals on Moving Bodies," *Journal of the Optical Society of America*, July 1937, Vol. 27, p. 271, emphasis added). The corollary, of course, is that the Earth may not be moving.

[738] *De Labore Solis*, p. 43. As we will see shortly, all claims that the Earth is moving based on stellar aberration are presumptuous, since from Airy's experiment it has been proven that the necessity of tilting a telescope to catch all of a star's light is due to a fixed Earth in a moving star system, not a moving Earth in a fixed star system. Interestingly enough, the type of experiment Airy performed was suggested more than a century earlier in 1766 by Ruggiero Giuseppe Boscovich (1711-1787), a Jesuit astronomer, and again by Augustin Fresnel in 1818, which may have been the source of Airy's idea. In 1746 Boscovich published a study on the elliptical orbits of the planets based on the Copernican system (*De Determinanda Orbita Planeta ope catoptrica*, Rome 1749). He published a second edition in 1785 (*Opera Pertinentia ad Opticam et Astronomiam*, Bassan, 1785). Perhaps if Boscovich had had the good fortune to perform an Airy-type experiment, he might have thought twice about adopting the Copernican system.

Relativity theory, by its very nature, is especially susceptible to anti-Copernican interpretations since for everything that Relativity claims for itself by a moving Earth in a fixed universe can easily be "relativized" for a fixed Earth in a rotating universe. In fact, stellar aberration was indeed a major concern of Einstein's for that very reason, since Relativity theory, in principle, demands equal viability for both of the aforementioned perspectives.[740] Einstein's concern was justified. As we will see, Airy's experiment threw a wrench into the reciprocity of Relativity, for it demonstrated that it really does make a difference whether the Earth is moving or at rest in regards to how light from a star travels through a telescope mounted on the Earth. Consequently, Einstein could not "relativize" the results of Airy's experiment since stellar aberration provided a distinction he could not readily overcome. Consequently, Einstein would be forced to resort to the *ad hoc* "field transformation" equations of Henrick Lorentz to answer Airy's results; and although others didn't voice their opinions too loudly for fear of being ostracized, everyone knew that Einstein's efforts were just mathematical fudge factors. There was one inescapable fact that Airy's telescope was revealing: barring any mathematical fudging, Earth was standing still and the stars were revolving around it, not vice-versa. Hence, the importance of the Michelson-Morley experiment was that it confirmed, by a significantly different kind of experiment, the same results that Airy found in his water-filled telescope sixteen years earlier. But before we get to Airy's actual experiment we need to cover the history that led up to it.

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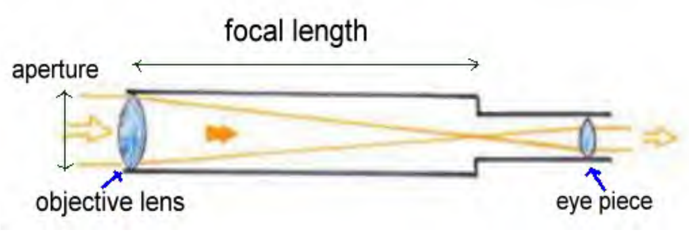
[739] "The Einstein-De Sitter Debate and Its Aftermath," Michael Janssen, University of Minnesota, p. 3.

[740] Einstein demonstrated this in his 1911 paper "Über den Einfluß der Schwerkraft auf die Ausbreitung des Lichtes," *Annalen der Physik*, 35, 903f. According to Einstein, the argument of whether the Earth rotates or the heavens revolve around Earth is understood as nothing more than a choice between reference frames. The Earth's poles would flatten from either reference frame, says Einstein. In the frame of a rotating Earth in a fixed star system, the centrifugal force is a consequence of the Earth's uniform acceleration relative to the fixed stars. In a fixed Earth frame, Einstein says the centrifugal force is attributed to the effect of "the rotating masses" [stars] that are generating a gravitational field that causes the Earth's poles to flatten. The two frames are said to be equivalent, since there is equivalence between inertial mass and gravitational mass. As we will see later, the flattening of the Earth's poles occurs, according to Einstein, because the gravity of the stars creates a curvature of the space-time fabric surrounding the Earth.

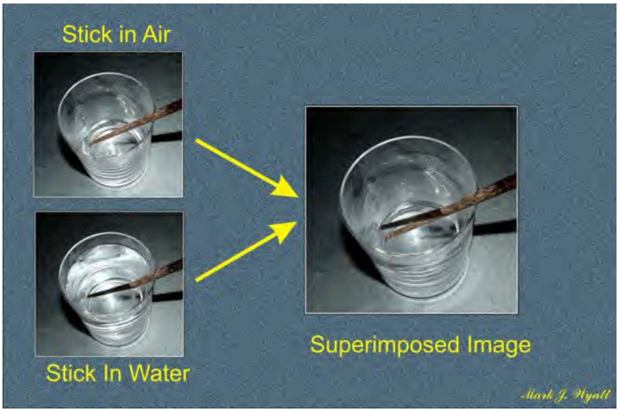
The Experiments of Dominique Arago

The "Fizeau experiment" and "Airy's observations" that Einstein mentions in the Shankland interview have their impetus for concern a few years prior in the work of **Dominique François Arago** (1786-1853). Arago is one of France's most celebrated scientists. He had his hands in many fields of interest, but his unique work with light set the pace for many years to come. For our purposes, there are two things of note in his discoveries between the years 1810 to 1818. First, Arago observed one star through a telescope for the whole course of a year. In the heliocentric system the Earth will move toward the star and then move away. Arago reasoned that the focal length of his telescope would need to change when viewing the star since the limited speed of light must be compensated to accommodate both a receding Earth and an advancing Earth at six month intervals.



To his utter astonishment, Arago did not need to adjust the focus to see the star clearly. If one were predisposed to heliocentrism one might interpret this phenomenon as an indication that the stars were far enough away that, regardless of whether the Earth moving toward or away from the star, the star light is unaffected. If one were a geocentrist, one would be inclined to conclude that there is no need to adjust the focus simply because the star actually is where it appears to be and there is very little relative movement between the Earth and the star on an annual basis.

Second, Arago had previously experimented with light beams traveling through glass. He showed that light traveled slower in denser mediums, such as glass or water, and this, in turn, helped support the wave theory of light (as opposed to the particle theory). Arago assumed the light waves had a uniform speed through the ether. If Earth was moving against the ether (as would be the case if it were revolving around the sun) then the ether should impede the speed of light, just as it did in glass or water. Arago's experiment showed, however, that whether the light beam going through the glass was pointed in the direction of the Earth's supposed movement or opposite that movement, there was no effect on its speed going through the glass. Moreover, he showed that a light beam pointed toward or away from the Earth's supposed orbit had the same **refraction in glass** as the refraction of starlight in glass.[741] Hence, in whatever way he



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[741] François Arago, "Mémoire sur la vitesse de la lumière, lu à la prémière classe de l'Institut, le 10 décembre 1810. *Académie des sciences* (Paris). *Comptes Rendus* 36 (1853):38-49. As Arthur Miller describes it: "…Arago covered half of his telescope with an achromatic prism. He found that the aberration angle was independent of whether light passed through the prism…" (*Albert Einstein's Special Theory of Relativity*, p. 15).

tested the incidence of light, it always showed Earth at rest in the ether. As E. T. Whittaker puts it:

> Arago submitted the matter to the test of experiment, and concluded that the light coming from any star behaves in all cases of reflexion and refraction precisely as it would if *the star were situated in the place which it appears to occupy* in consequence of aberration, *and the earth were at rest*; so that the apparent refraction in a moving prism is equal to the absolute refraction in a fixed prism.[742]

Here was the first confirmed evidence since the Copernican hypothesis arose three centuries prior that science had been far too presumptuous in opting for a heliocentric solar system. In order to stop the hemorrhaging, science had to find the proper tourniquet to save the appearances for a moving Earth.

The Experiments of Augustin Fresnel

Enter **Augustin Jean Fresnel** (1788-1827). Fresnel worked with Arago on various occasions, and it was left to Fresnel, the more famous of the two, to explain Arago's results by retaining the moving Earth model. Both Arago and Fresnel were advocates of the wave theory of light, and Arago asked Fresnel if it would be possible to explain the results of his starlight experiment by the wave theory. Fresnel came up with an ingenious answer and explained it to Arago in a letter dated 1818.[743] He postulated that there was no effect on the incidence of starlight because the ether through which the light traveled was being "dragged," at least partially, by the magnifying glass of the telescope.

Because ether was understood to permeate all substances, Fresnel hypothesized that there was a certain amount of ether trapped within the glass and it would be denser than and independent from the ether in the surrounding air. The key to understanding this theory is that Fresnel held that the ether outside the glass was immobile. As the glass moved with the

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[742] E. T. Whittaker, *A History of the Theories of Aether and Electricity*, Dublin University Press, Longmans, Green and Co., 1910, p. 116, emphasis added.

[743] "Lettre d'Augustin Fresnel à François Arago sur l'influence du mouvement terrestre dans quelques phénomènes d'optique," *Annales de chimie et de physique* 9 (1818): 57-66, 286. Reprinted in *Oeuvres Complètes*. Paris: Imprimerie impériale, 1866-1870, vol. 2, pp. 627-636.

Earth's assumed movement and against the immobile ether outside, the glass would "drag" its trapped ether with it.

Thus Fresnel conveniently concluded that Arago couldn't detect any difference in the speed of light because the glass in his experiment was dragging the ether just enough in the opposite direction to the Earth's movement so as to mask the Earth's speed of 30 km/sec through the immobile ether.[744]

To understand the rationalization of Fresnel's "drag" to explain Arago's results, let's use an example. We have two telescopes, one hollow and one filled with glass. Both telescopes are viewing the same star. Will each telescope measure the same aberration (bending) of the starlight? One would think that, since light bends appreciably more in glass, that the glass telescope should show considerably more bending of the starlight compared to the hollow telescope, just as when we put a pencil in a glass of water and notice the pencil appear to bend in the water. (We would notice the same bending if we put half of the pencil in a glass cube).[745] But as we will see shortly, all such telescopic views of stars will show no more bending of starlight in the glass telescope than in the hollow telescope. There is something about the incidence of starlight received on the Earth that causes this strange phenomenon. As we will see, the natural and least complicated answer for this phenomenon is that Earth is not moving, and since the stars, although moving, are so very far away, the angle of incidence will be virtually the same on one side of the Earth as on the other, that is, it will always be straight overhead and thus produce no refraction or diffraction through air telescopes as opposed to glass telescopes.

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[744] As van der Kamp states: "…an omnipresent Fresnel drag caused by an at least 30 km/sec ether wind in all transparent materials, whether water, glass, perspex, champagne, or castor oil. However, no observer at rest on the Earth's surface can measure this drag as such. Only a supposed 'change' in that drag becomes visible by setting these substances in motion relative to such an observer" (*De Labore Solis*, p. 45). Note that scientists in Fresnel's day were using the term "immobile ether" due to the fact that they believed the Earth was moving through an immobile ether rather than the ether moving against an immobile Earth. The two environments will, in fact, produce the same results, but to avoid any implications of admitting to a fixed Earth, the scientists of this period invariably describe it as an "immobile ether." Some current scientists do the same. For example, Stephen Marinov, whose experiments show an ether-drift of 279-327 km/sec, declares that the Earth is moving through it toward the midpoint of the constellations Virgo, Hydra and Libra. Marinov's calculations are very close to those of Dayton Miller's 1925 interferometer experiments, which registered the Earth's movement at 208 km/sec, but toward Draco. See footnotes later in this volume concerning Dayton Miller's experiments for explanation of this ether-drift in respect of Geocentrism.

Once again, Fresnel explained this phenomenon using the model of an Earth moving at least 30km/sec around the sun and against the incidence of starlight. As noted above, he claimed that the glass telescope had a certain amount of ether contained within it that was denser than the ether outside.[746] When the starlight enters the glass telescope, the extra ether, by using the Earth's movement, had the ability to "drag" the starlight sufficiently enough away from the immobile ether in the air to make the light within the glass appear to equal the speed of the starlight in the hollow telescope. Incidentally, glass could perform this feat, according to Fresnel, because the light entering it was understood as a wave, whereas if light were composed of particles, Fresnel's theory would not work.

By this clever manipulation of something he couldn't even detect (*i.e.*, the ether) and a nature of light he hadn't even proven (*i.e.*, exclusively waves), Fresnel helped science avoid having to entertain a non-moving Earth as the most likely answer to Arago's puzzling findings. Obviously, to fair-minded observers, Fresnel's explanation appears to be a little too convenient, especially since he arrived at his solution without any physical experimentation; rather, he merely postulated various assumptions just so he and Arago could escape the geocentric implications that were haunting them and the rest of the science community. As one heliocentrist seeking to soften the blow states:

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[745] This bending is described by Snell's law of refraction, which is the relationship between the angles of incidence and refraction, and the indices of refraction of two mediums. The formula is $n_i \times \text{sine}(\theta_i) = n_r \times \text{sine}(\theta_r)$, where θ_i = the angle of incidence; θ_r = the angle of refraction; n_i = the index of refraction of the incident medium; n_r = the index of refraction of the refractive medium.

[746] Fresnel held that the ether density in the transparent medium (*i.e.*, glass) was proportional to the square of the medium's index of refraction. As such, the ether inside the glass moving through the ether in the air, will move with a fraction $[f = 1 - 1/\eta^2]$ of that ether in the air's velocity.

> It is possible generally to prove how Fresnel's theory entails that not a single optical observation will enable us to decide whether the direction in which one sees a star has been changed by aberration. By means of aberration we can hence not decide whether the Earth is moving or rather the star: only that one of the two must be moving with respect to the other can be established. Fresnel's theory is hence a step in the direction of the theory of relativity.[747]

Although "Relativity" theory would eventually be called to make an unprecedented rescue for Copernicanism, as this saga progresses we will see that it, too, offers no satisfactory escape from Arago or the other stellar aberration experiments that would be performed in the coming years. One problem led to another, and, in light of these intricate experiments, there would be no peace for those resting on the laurels of Copernicus and Kepler. Obviously, in order to add some legitimacy to Fresnel's hypothesis, another experiment had to be devised.[748]

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[747] J. D. ver der Walls, *Ober den wereldether*, p. 78. Cited in *De Labore Solis*, p. 34.

[748] Mathematically, Fresnel claimed that ether "drags" the light in the glass telescope in accord with the equation: $c = (1 - 1/\eta^2)\nu$, where c is the speed of light, η is the refractive index of the medium, and v is the velocity of 30 km/sec of Earth's supposed orbit; or more simply $f = 1 - 1/\eta^2$ where f is the "Fresnel drag" and η is the refractive index of the medium. This is described in Fresnel's paper, *Ann. De Chimie*, 17:180 that he wrote in 1821. Please note that our criticism of Fresnel's "drag" theory does not necessarily mean we deny that ether has the ability to drag light. We are critiquing the rather convenient formula Fresnel derived to mask a motionless Earth. In any case, in 1828, and with a more refined view in 1839, Augustine Cauchy, following the work of Claude Navier, postulated that the ether has the same inertia in each medium, but different elastic properties. The ratio of the elastic constant (p) to the measure of a substance's density (') is equal to the speed of light squared (c^2). Fresnel used this ratio and proposed that when the glass plate moves through the ether, it sweeps up ether and obtains a new density. The velocity of the glass plate with respect to its internal ether will be different with respect to the external ether. Although the velocity and density of the internal ether changes, the total mass of the ether must remain the same. Because of the refractive index of light (η), the velocity of light in the moving glass plate is to be subtracted from the velocity of the ether impeded through the

The Experiments of Armand Fizeau

Enter Armand Fizeau (1821-1896), the very person whose experiments Einstein mentions as a major cause for concern and the impetus for his

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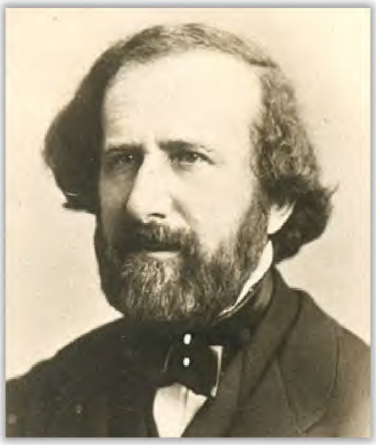
plate. The velocity of light, as measured by an observer at rest in the frame of the moving plate is added to the velocity of the plate through the same frame. In 1845 George Stokes (1819-1903), objecting to the notion that a massive body such as the Earth could move through the ether without disturbing it, advocated that stellar aberration was caused by the Earth dragging along all of the ether near its surface as it rotates, which he coined "the etherosphere," and which theory Michelson "revered above all others" (Loyd Swenson, *The Ethereal Ether*, p. 24). Stokes' view was diametrically opposed to Fresnel's concept that ether was immobile and only partially dragged by such things as glass. Fresnel held to an immobile ether to accommodate his "transverse" wave theory of light (as opposed to longitudinal waves), a theory he was forced to adopt to explain light polarization. As such, Fresnel required a solid ether (as opposed to a fluid ether) to produce the forces needed to oppose the distortions caused by transverse waves. In further developments, in 1849 Stokes suggested that the ether was not dragged by the moving glass plate, but that the ether within the plate was compacted. In his work with light diffraction around opaque bodies and light diffraction in the sky, he showed that the vibration of ether particles is at right angles to the plane of polarization. The same did not hold for crystals, so Stokes reversed Cauchy's hypothesis, making the elastic properties of ether the same in all materials, but allowing the inertia to be anisotropic. In the end, Stokes' ether behaves as a rigid solid for high-frequency oscillations of light but as a fluid for the slow moving celestial bodies. In 1867, further experiments forced Stokes to withdraw his theory. (*cf.*, G. G. Stokes, "On the Aberration of Light," *Philosophical Magazine* 27, pp. 9-15, 1845; "On Fresnel's Theory of the Aberration of Light," *Philosophical Magazine* 28, pp. 76-81, 1846; "On the Constitution of the Luminiferous Ether Viewed with Reference to the Phenomenon of the Aberration of Light," *Philosophical Magazine* 29, pp. 6-10, 1846; "On the Constitution of the Luminiferous Ether," *Philosophical Magazine* 32, pp. 343-349, 1848). In the same year, Joseph Boussinesq proposed that, rather than ether having differing inertia in various media, it is the same in all locations but interacts in various ways depending on the type of materials. By 1888 R. T. Glazebrook revived Cauchy's wave theory and combined it with Stokes' anisotropic ether to agree with Stokes' 1867 experiment. In the early 1870s, Wilhelm Veltmann objected to Fresnel's theory due to the differences in refractive indexes for the various colors of light, which would require Fresnel's drag to be different for each color ("Über die Fortplanzung des Lichtes in bewegten Medien," *Annalen der Physik* 150, pp. 497-535, 1873). In 1912, Larmor held that the ether itself could not be detected, only its consequent effects. In 1951 Paul Dirac suggested that physics needed a revised ether theory, as did Louis de Broglie in 1971.

invention of Relativity theory.[749] Fizeau needed to prove Fresnel's "drag" theory so as to have a physical, not merely theoretical or mathematical, answer for Arago's results. So horrible were the implications of Arago's experiments that counter-experiments such as the one Fizeau would soon undertake were described as an attempt to "find the ether" or "discover the nature of the ether" rather than what was truly at stake – finding out whether the Earth was really moving or not.



By and large, scientists strictly avoided language suggesting that the Earth could be motionless, for the Copernican Principle, although possessing not a shred of proof, was the holy grail of the science establishment and no one dare trespass its domain. Whereas the nineteenth century experimenters often camouflaged worries that Earth could be standing still in space by referring instead to a "motionless ether," twentieth century commentators after Einstein consistently avoided the geocentric implications of the nineteenth century experiments by turning the issue into one of "searching in vain for" or "abandoning" the elusive ether once they found out that the experiments invariably led to the possibility of a motionless Earth. To get a feeling of this sentiment, the reader need only recall the words of Edwin Hubble we cited earlier: to

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[749] That Fizeau probably knew the stakes for failure would require a rejection of Copernican cosmology is supported by the fact that he worked very closely with Jean Foucault (1819-1868), famous for the Foucault Pendulum which hangs in many of today's scientific museums as the so-called "proof" of the Earth's rotation. Fizeau and Foucault had worked together a few years before 1851 in demonstrating that the speed of light could be determined in the laboratory, not just astronomically. Fizeau became famous for his "toothed-wheel" experiment to measure light's speed.

Hubble, finding the Earth in the center of the universe would be “intolerable” and a “horror” that “must be rejected.”

As for Armand Fizeau, his initial experiments found that the speed of light through glass varied with the color of the light, something for which neither Arago nor Fresnel tested. This meant, of course, that the ether would have to be reacting differently with various colors of light; or, there was a different amount of ether trapped in the glass for each particular color, options which seemed far-fetched. Fizeau proposed the hypothesis that the ether possessed elasticity, and varying degrees of elasticity would cause various reactions with light.

Thus, Fizeau set out to test the constitution of the ether in 1851. He sent two parallel light beams in opposite directions through tubes of water in which the water was flowing rapidly. In this way, one beam would be traveling with the flow of water, the other against the flow. When the light beams meet back at the receiving plate, the one traveling against the flow of water should arrive later, just as a person swimming against a water current will need more time to complete a journey than one swimming with the current. As the light beams arrive at the final destination at different times, the peaks and troughs of their wavelengths will not be in synch, which will then cause light and dark fringe markings to appear on the receiving plate. Water was the perfect medium to make such a test. Since light’s speed in water is two-thirds of the upper limit at which it is said to travel in a vacuum, the water-medium would provide enough margin from the upper limit so that one could easily notice whether its speed was changed. As it turned out, the interference fringes showed a difference in the arrival times of the two beams and this result was said to support the Fresnel “drag” formula.[750]

Although Fizeau helped to give credibility to Fresnel’s “drag” theory, he did little to establish that the Earth was moving through the ether. If we on Earth are moving through ether, then the speed of the light in the water tube will be increased with the speed of the Earth’s motion (30 km/sec).

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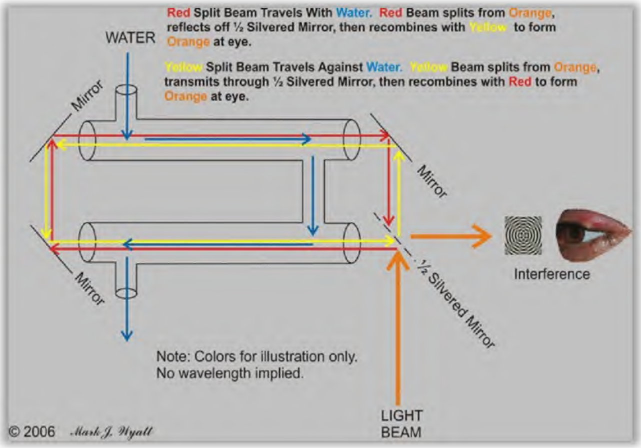
[750] Armand Hippolyte Louis Fizeau, “Sur les hypotheses relatives à l’éther lumineux, et sur une experience qui paraît démontrer que le mouvement des corps change la vitesse à laquelle la lumière se propage dans leur intérieur” *Académie des sciences* (Paris), *Comptes Rendus* 33 (1851):349-355. In mathematical terms, Fizeau’s formula to determine the interference fringes is $/ = 4\eta^2 fvL/\lambda c$ where λ is the wavelength of light; v is the speed of the water; L is the length of the tubing; f is the drag factor; η the refractive index; and c the speed of light. In the experiment Fizeau calculated a difference of $\delta = 0.23$ interference lines, which implies an empirical drag factor $f = 0.48$. Since the theoretical drag is calculated from $f = 1 - 1/\eta^2$, which is 0.435, there is a margin of error of approximately 10% between Fresnel and Fizeau.

But the outcome was quite different than what Fizeau expected. The speed of light was not a sum of the velocity of the light added to the velocity of the Earth. Rather, the only effect Fizeau found on the speed of light was that which was induced by the water's refractive index. This was quite a dilemma. On the one hand, it showed that light was affected by a medium (*i.e.*, water), but on the other hand, the light was not being affected by the medium of ether, that is, its speed was not increased or decreased as the Earth went through the ether. The logical conclusion of this experiment is that it was presumptuous of Fizeau to assume the Earth was moving through the ether, since a fixed-Earth can easily account for why the light was not affected by the ether but only by the water (*i.e.*, by refraction).[751]



Red Split Beam Travels With Water. Red Beam splits from Orange, reflects off ½ Silvered Mirror, then recombines with Yellow to form Orange at eye.

Yellow Split Beam Travels Against Water. Yellow Beam splits from Orange, transmits through ½ Silvered Mirror, then recombines with Red to form Orange at eye.

Note: Colors for illustration only. No wavelength implied.

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In order to escape this problem, Fizeau postulated that, as the water flowed, it would drag *only some* of the ether with it, and thus make the light move against *only some* of the ether, which would then appear as an alteration in the speed of the light in the water, and which, coincidentally, would equal the refractive index of the water, and which would also equal the Fresnel "drag" coefficient. Thus it seemed that Fizeau's experiment supported Fresnel's, at least the way they wanted to interpret it. In reality, both Fresnel and Fizeau, without any proof whatsoever, were already discounting a fixed-Earth as a viable solution to the unexpected results of their experiments.[752]

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[751] In Fizeau's experiment no distinction is made between the ether in the water and the ether in the air, since both light beams are traveling through water, and it is only those light beams which are subsequently measured.

[752] In a repeat of Fizeau's experiment in 1884, Michelson and Morley agreed with Fizeau's results, which they published in 1886. They wrote: "…the result of this

Despite this apparent "solution," there was still an open question: would Fizeau's use of water to drag ether and impede the speed of light prove to be true for starlight? Of course, the reason the question of starlight would surface is not because starlight is intrinsically different than laboratory light, but only because underneath it all the parties involved were quite cognizant of the cosmic implications of testing starlight, that is, because of the star's immense distance from Earth it had the ability to determine whether the Earth was really moving or not. Arago had already demonstrated this fact to the science community back in 1810 when he observed no change in the incidence of starlight over the course of a year's observations, but the Copernicans were determined to put these results in the category of "interesting, but unconvincing."

The Experiments of James Bradley and George Airy

Twenty years after Fizeau's experiment, George Biddell Airy would perform his own water-tube experiment, which, to his utter surprise, would confirm Arago's results – that Earth was standing still in space. Although Fresnel temporarily saved the world from having to scuttle the Copernican theory, we will see that the nature of Airy's experiment left Einstein with no choice but the fantastic postulations of Relativity theory to answer Airy's results.

George Airy belonged to the exclusive Astronomer Royal of England. He was a well-respected scientist and had quite a reputation and audience for his endeavors. But Airy was an avowed heliocentrist just as Einstein, so it is not Airy's position as an esteemed scientist for which we make reference to his work, but precisely because of his failure to prove his cherished view of cosmology. Airy was quite certain, at least before he did his experiment, that his water-filled telescope would prove the Earth revolved around the sun. Hence, he was quite surprised at his "failure."

Here's how "Airy's failure" transpired. Airy knew from Arago that: (1) light's speed was slower in a solid transparent medium than in air; (2) that any movement ascribed to the Earth did not affect the speed of light, and (3) that Fresnel's explanation of Arago's experiment was that the glass plate "dragged" the ether and acted independently of ether in the air. Airy, by merely enhancing the procedures of those before him, decided to use a

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work is therefore that the result announced by Fizeau is essentially correct: and that the luminiferous ether is entirely unaffected by the motion of the matter which it permeates" ("Influence of Motion of the Medium on the Velocity of Light," *American Journal of Science*, 31, p. 386, 1886). But they would later withdraw their support after their 1887 interferometer experiment.

source of light outside Earth, namely starlight, and direct it through different mediums to see if the light was affected.

Before we see what Airy's experiment did in the battle for whether the Earth was fixed in space, it would be beneficial to know a little of the history about the nature of starlight. As early as 1640 the astronomer Giovanni Pieroni observed that various stars shifted their position in the sky during the year. As we noted earlier, Francesco Rinuccini brought this evidence to Galileo's attention in 1641, but Galileo was unimpressed. Robert Hooke, three decades later, in 1669, noticed the same kind of shifting for one star in particular, *Gamma Draconis*. Since everyone from the time of Copernicus had been looking for physical evidence of a moving Earth, Hooke actually thought he had discovered the first parallax as its proof. Almost another thirty years later (1694), John Flamsteed observed the same kind of shifting in the star Polaris.

James Bradley and *Gamma Draconis*

Another thirty years later, James Bradley (d. 1762) set out to determine whether Hooke's observations were, indeed, a parallax of *Gamma Draconis*. During the years of 1725-1728 he noticed that during the course of a year the star inscribed a small ellipse in its path, almost the same as a parallax would make. In the heliocentric system, parallax is understood as a one-to-one correspondence between Earth's annual revolution and the star's annual ellipse, but Bradley noticed that the star's ellipse was not following this particular pattern.[753]

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[753] Parallax, as measured from Earth, is understood as the measure of the apparent movement of a star against more distant stars that do not move. There are about 700 stars in our sky that are close enough to Earth and far enough from

Stellar aberration as seen from Earth

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background stars in order to form a parallax. In the heliocentric system, which Bradley was using, a star’s parallax is measured by using the Earth’s orbit. At each point on the Earth’s path, a star with parallax will appear on the opposite side of the Earth’s orbit in the star’s ellipsis. For example, in the heliocentric system, if the Earth is at twelve o’clock in its orbit the star will be at six o’clock in its ellipsis; if Earth is at three o’clock, the star will be at nine o’clock. In stellar aberration, the Earth and the star will not be on opposite sides of their respective ellipses. So, if the Earth is at twelve o’clock in its orbit, the star will also be at twelve o’clock in its ellipsis. Bradley noticed that *Gamma Draconis* was following the stellar aberration pattern, not the parallax pattern, since it was behind the parallax pattern by at least three months. Bradley found a 20.47° angle of aberration. As we will see later, stellar aberration can also be explained by the geocentric model, since in that model the stars are centered on the sun and partake of the sun’s annual movement around Earth, and thus stellar aberration will occur in exactly the same proportions as in the heliocentric system. Incidentally, Bradley also discovered that *Gamma Draconis* traced out an additional smaller ellipse in the course of 18.6 years. The heliocentric explanation for this ellipse is that the moon, since its orbital precession rotates around Earth once every 18.6 years, is altering the Earth’s axial spin (otherwise known as nutation). This explanation fails, however, since it would require each star to have the same 18.6 year ellipse as *Gamma Draconis*. The geocentric explanation for the 18.6 year ellipse is that, as the universe rotates around Earth, a slight uneven mass distribution causes a small precession of the universe of 18.6 years, which is part of a larger precession of 25,800 years (the heliocentric system has a 25,800-year precession of the Earth’s axial rotation). These dual precessions, in conjunction with the stars that move within those precessions in a specified elliptical path depending on their distance from Earth, distance from the North Star (Polaris), and their mass, will create a specified ellipse for each star, as seen from Earth.

At this point, astronomical science was still waiting for a confirmed parallax of any star, since no one had ever measured one. A confirmed measurement of parallax would not be made until more than a century later by Friedrich Bessel in 1838. So Bradley, reasoning that *Gamma Draconis* was too far away to register a parallax, found another explanation, and it was a rather ingenious one. He theorized that the star's annual ellipse was being formed because the speed of light was finite.[754] That is, the star wasn't actually moving in the sky; rather, its light, moving at a finite speed, was hitting a moving Earth, an Earth that for six months was moving toward the star, and in the next six months was moving away from the star. While the Earth moved toward the star, the star's light would hit the Earth sooner, but while the Earth moved away, the light would hit it later. Bradley reasoned that, if light's speed was infinite, there would be no such effect, but since it is finite, these back-and-forth movements of the Earth would translate into seeing the star move in an ellipse over the course of a year. This explanation was a welcome relief for the heliocentric view, since until Bradley no one, including Galileo who died in 1642, had supplied any real evidence that the Earth could be revolving around the sun.[755]

The only "evidence" Galileo's contemporaries provided was that of analogy, that is, because he saw moons revolving around Jupiter through his telescope he conjectured that smaller bodies (such as the Earth) had to revolve around larger bodies (such as the sun). As one author put it, in Galileo's day, "the telescope did not prove the validity of Copernicus' conceptual scheme. But it did provide an immensely effective weapon for the battle. It was not proof, but it was propaganda."[756] Thus, the

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[754] Up until this time, the only one who had suggested that light had a finite speed was Ole Römer in 1670 as he was observing the variations between two successive eclipses of Io, one of Jupiter's moons. The eclipse is the shortest in duration when, in the heliocentric system, Earth is moving toward Jupiter, and longest in duration when Earth is moving away. As we will see later, this same phenomena can be explained by the geocentric model since in that model, Jupiter, revolving around the sun, is moving toward and away from a fixed Earth in the same proportions as in the heliocentric system.

[755] As one modern astronomer presumptuously concluded: "The discovery of this aberration was the first experimental proof that the earth has a yearly motion and that Copernicus was right" (A. Pannekoek, *A History of Astronomy*, 1961; originally published in 1951 under the Dutch title: *De Groei van ons Wereld*, cited in *The Biblical Astronomer*, Vol. 3, No. 64, 1993).

[756] Thomas Kuhn, *The Copernican Revolution*, 1959, p. 224. Kuhn adds: "The opposition took varied forms. A few of Galileo's more fanatical opponents refused even to look through the new instrument… Others…claimed…they were apparitions caused by the telescope itself. Most of Galileo's opponents behaved

Arago/Fresnel/Fizeau affair was more or less an interlude until someone would come along and either prove or disprove Bradley's hypothesis.

Enter **George Airy** (1801 – 1892). As ingenious as Bradley's answer was to the ellipse formed by *Gamma Draconis* so was Airy's experiment to prove it right or wrong. Accepting that light's speed was finite, Airy had to figure out some way of determining whether the light from a star was affected by Earth's presumed motion. Whereas Bradley used only one kind of telescope, Airy had the ingenious idea of using a second telescope standing right next to the first telescope, but filled with water instead of air. Since Arago/Fresnel/Fizeau had already shown that light's speed was slowed by glass or water, Airy assumed that if a telescope was filled with water then the starlight coming through the water should be slower than it would be in air and thus bend the starlight outward toward the side of the telescope and away from the eyepiece (just as we see light bent when we put a pencil in water). In order to compensate for the outward bending of the starlight, Airy assumed he would need to tilt his water-filled telescope just a little more toward the lower end of the star so that its light would hit his eyepiece directly rather than hitting the side of the telescope.

One would do the same, for example, if he were carrying a drinking glass while he were running through a rainstorm. In order to catch the raindrops so that they hit the bottom and not the side of the drinking glass, one must tilt the drinking glass forward a bit in order to compensate for one's running speed. Another example that illustrates this principle rather well is the task of dropping a drop of water into a test tube from an eye-dropper. If the test tube is mounted so that it stands straight up on a rotating disc and one tries to drop a drop of water into the test tube as it comes around, the drop will invariably hit the inside of the test tube. One must tilt the test tube slightly in the direction of the rotation in order to allow the drop to hit the bottom of the test tube. Light, because it reacts as

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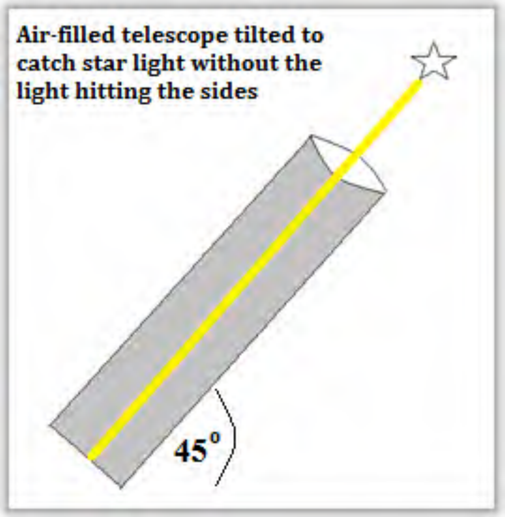
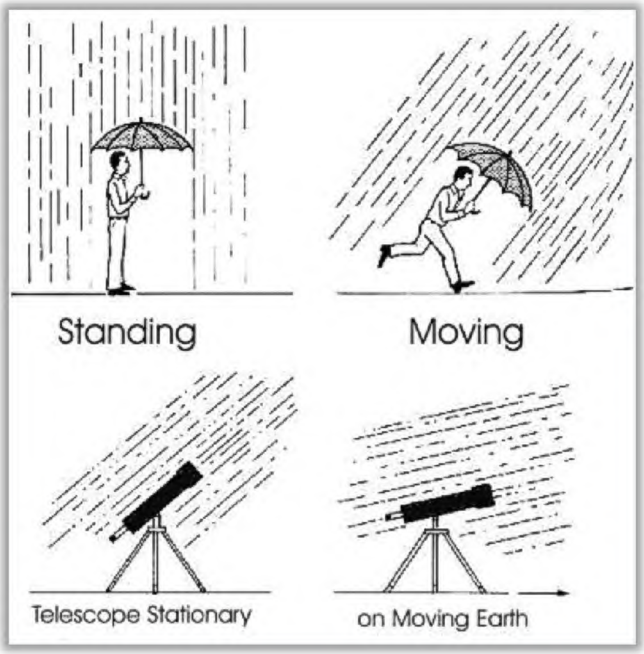
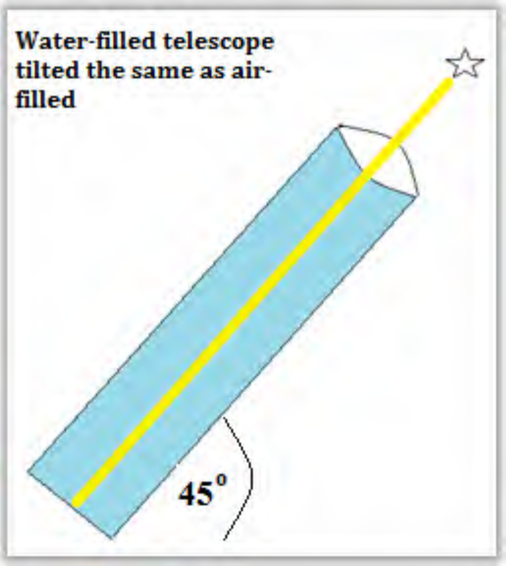
more rationally. Like Bellarmine, they agreed that the phenomena were in the sky but denied that they proved Galileo's contentions. In this, of course, they were quite right. Though the telescope argued much, it proved nothing" (*ibid.*, p. 226).

if it were a substance, moves in a similar fashion to the drop of water (only it moves much faster than rain and eye drops and thus the effects are much more subtle).


Air-filled telescope tilted to catch star light without the light hitting the sides
45°


Standing
Moving
Telescope Stationary
on Moving Earth

Although Airy had suspected the outcome prior to the actual experiment, indeed, he soon discovered that he was not required to tilt his water-filled telescope toward the star to any greater degree than his air-filled telescope.



These results indicated that Earth wasn't moving, since if there is no additional adjustment necessary for a water-filled telescope toward the direction of the starlight it means the starlight is coming into both telescopes at the same angle and speed. If Earth were moving, then a water-filled telescope would have to be titled toward the starlight a little more acutely than an air-filled telescope. This is so for two related reasons: (1) in the heliocentric model, the Earth is moving sufficiently against the incidence of starlight upon it, and thus the water-filled telescope would not be able to catch all of the starlight in the slower medium of water. It would have to be titled slightly ahead of the air-filled telescope to make up for light's slower speed in water; and (2) since the starlight is coming from outside Earth's ether environment, then one cannot readily explain Airy's failure by saying that the denser medium (*i.e.*, water as opposed to air) carried a higher or lower amount of ether, as Fresnel had claimed. Starlight seemed to be unaffected by the ether, or any medium, since Airy proved that its light was coming to Earth at one specified angle and speed.[757]

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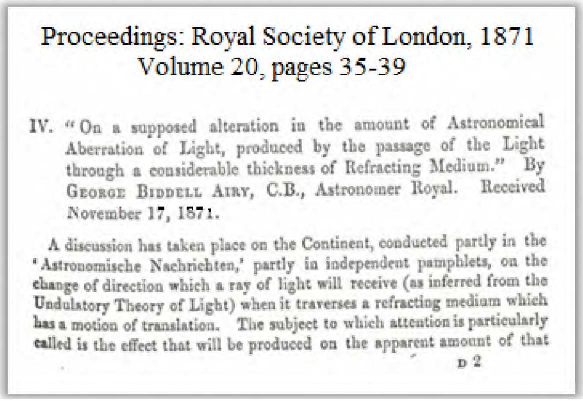
[757] George B. Airy, "On a supposed alteration in the amount of astronomical aberration of light produced by the passage of light through a considerable thickness of refracting medium" (Proceedings of the Royal Society, London,



Proceedings: Royal Society of London, 1871
Volume 20, pages 35-39

IV. "On a supposed alteration in the amount of Astronomical Aberration of Light, produced by the passage of the Light through a considerable thickness of Refracting Medium." By George Biddell Airy, C.B., Astronomer Royal. Received November 17, 1871.

A discussion has taken place on the Continent, conducted partly in the 'Astronomische Nachrichten,' partly in independent pamphlets, on the change of direction which a ray of light will receive (as inferred from the Undulatory Theory of Light) when it traverses a refracting medium which has a motion of translation. The subject to which attention is particularly called is the effect that will be produced on the apparent amount of that

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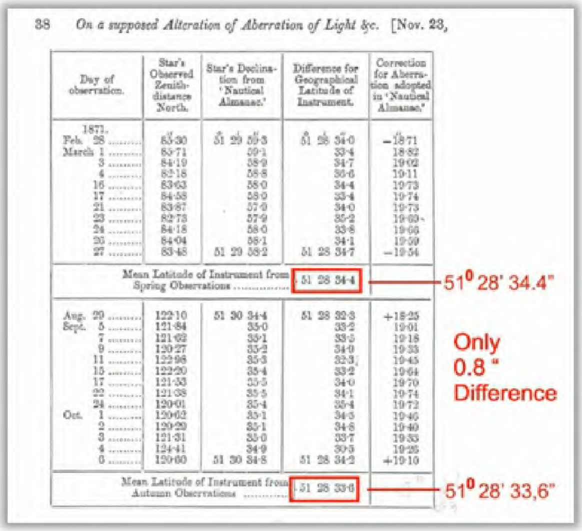

38 *On a supposed Alteration of Aberration of Light &c.* [Nov. 23,

Day of observation.	Star's Observed Zenith-distance North.	Star's Declination from 'Nautical Almanac.'	Difference for Geographical Latitude of Instrument.	Correction for Aberration adopted in 'Nautical Almanac.'
1871.				
Feb. 28	83·30	51 29 55·3	51 28 34·0	−18·71
March 1	83·71	59·1	33·4	18·82
3	84·19	58·9	34·7	19·02
4	82·18	58·8	36·6	19·11
16	83·63	58·0	34·4	19·73
17	84·58	58·9	33·4	19·74
21	83·87	57·9	34·0	19·73
23	82·73	57·9	35·2	19·69
24	84·18	58·0	33·8	19·66
25	84·04	58·1	34·1	19·59
27	83·48	51 29 58·2	51 28 34·7	−19·54
Mean Latitude of Instrument from Spring Observations			51 28 34·4	
Aug. 29	122·10	51 30 34·4	51 28 32·3	+18·25
Sept. 5	121·84	35·0	33·2	19·01
7	121·62	35·1	33·5	19·18
9	120·27	35·2	34·0	19·33
11	122·96	35·3	32·3	19·45
15	122·20	35·4	33·2	19·64
17	121·33	35·5	34·0	19·70
22	121·38	35·5	34·1	19·74
24	120·01	35·4	35·4	19·72
Oct. 1	120·02	35·1	34·5	19·46
2	120·29	35·1	34·8	19·40
3	121·31	35·0	33·7	19·35
4	124·41	34·9	30·5	19·25
6	120·60	51 30 34·8	51 28 34·2	+19·10
Mean Latitude of Instrument from Autumn Observations			51 28 33·6	

51^{0} 28' 34.4"

Only 0.8 " Difference

51^{0} 28' 33,6"

Excerpts from Airy's report to the Royal Astronomical Society

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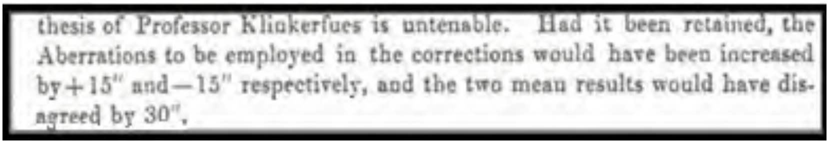
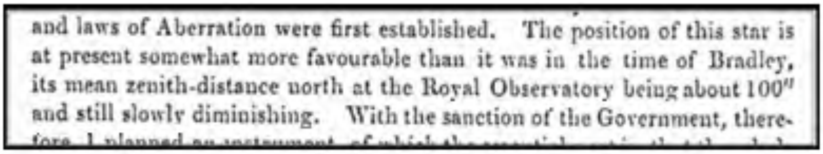
1871, pp. 35-39). As Arthur Miller describes it by means of a diagram: "Consider, in the geocentric system, a water-filled telescope whose line of sight to a star is normal to the direction of the star's velocity relative to the Earth which is $-v/N^2$ (according to Fresnel's hypothesis). The law of sines yields sin δ' = v/cN). Since the starlight is refracted on entering the water then δ' is not the aberration angle. Using Snel's law to relate v and δ', *i.e.*, sin δ = N sin δ', we obtain sin δ = v/c. This derivation is based on the ones of Veltmann (1873), Lorentz (1886) and Drude (1900). The notion of seeking deviations from stellar aberration in air by using a water-filled telescope had been suggested by Boscovich in 1766, and was mentioned by Fresnel (1818), who predicted no change because this experiment was equivalent to Arago's. Airy (1871) carried out the experiment and found no change in the aberration angle" (*Albert Einstein's Special Theory of Relativity*, p. 19).


thesis of Professor Klinkerfues is untenable. Had it been retained, the Aberrations to be employed in the corrections would have been increased by + 15″ and − 15″ respectively, and the two mean results would have disagreed by 30″.


and laws of Aberration were first established. The position of this star is at present somewhat more favourable than it was in the time of Bradley, its mean zenith-distance north at the Royal Observatory being about 100″ and still slowly diminishing. With the sanction of the Government, there-

At this point we should mention the fact that Bradley’s appeal to a 20.5” arc in the star’s movement as being due to a 30 km/sec revolution of the Earth around the sun assumes that the sun is a fixed object. Without taking the sun as fixed, Bradley would not be able to detect any aberration in *Gamma Draconis*. But according to modern cosmology, no object in the sky is fixed, and thus Bradley’s theory is nullified on that count alone. Otherwise, the sun is at rest or Relativity is wrong.

As we noted earlier, Arago had already postulated in theory what Airy found by experiment. Arago wrote a paper on the subject in 1839 and thus the science establishment should have anticipated Airy’s results.[758] In 1766 Giuseppe Boscovich, and afterward Augustin Fresnel in 1818, had also recommended testing Arago’s hypothesis by a water-filled telescope. In Airy’s experiment, the water-filled telescope would be analogous to Arago’s glass plate (or the glass-filled telescope example we offered earlier), since both would make light travel at a slower speed than in air. Fresnel, being a firm believer that the Earth revolved around the sun in an ether medium, explained Arago’s results by claiming the glass plate trapped the ether and thus dragged it and the light, giving the appearance of the bending of light in the glass plate. In fact, Fresnel would be quite satisfied in assuming that the plate dragged the ether just enough to be equal to the Earth’s presumed movement around the sun.[759] But it was not easy for Fresnel to explain Airy’s failure, because Airy found, with respect to two different telescopic mediums, there is no additional drag of starlight by the ether surrounding Earth. In other words, if Earth were moving, it would be moving against the ether, and thus the ether wind would be expected to push the starlight past the telescope. Airy showed that the ether was not pushing the starlight faster through one medium than the other since both telescopes viewed the star from the same angle. Fresnel would also not be able to explain Airy's failure if he claimed that the ether is moving with the Earth instead of against the Earth, otherwise he would have no more explanation why, in Arago's case, light is diffracted more in a glass plate than in air. Science was in a bind once again. Unless Airy's experiment could be answered, the world was about to stand still in space, both literally and figuratively.[760]

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[758] *Comptes Rendus de l’ Académie des Sciences*, 8, 326, 1839.

[759] In other words, the angle of refraction in the glass plate will equal the arc seconds Earth moves in its angular journey around the sun, since both are formed by Earth’s movement through the ether. Incidentally, although we emphasize that Fresnel was a “heliocentrist,” Arago and Airy were also heliocentrists, and thus “Airy’s failure” is a failure for heliocentrism.

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[760] Aware of the acute dilemma for heliocentrism that Airy's experiment presents, an example of how modern science seeks to rationalize its results is noted in the explanation of S. Tolansky on the art of telescope viewing: "If the Fresnel drag coefficient be introduced into the calculation of the aberration, there emerges the fact that the aberration is the same with or without water in the telescope. Thus, conversely, Airy's negative result confirms the validity of the Fresnel coefficient" (*An Introduction to Interferometry*, 1973, p. 98, cited in *De Labore Solis*, p. 35). What Tolansky didn't tell his students is that if the Fresnel coefficient is NOT used for both telescopes, they would both still produce the same aberration, and thus the Fresnel drag becomes superfluous, except for those trying to save the appearances for heliocentrism. As van der Kamp notes, "…the drag coefficient cannot be dragged into court to vindicate Copernicus" (*op. cit.,* p. 36). Another objection comes from Wolfgang Pauli. With his typical pungency, Pauli wrote in 1958: "The Airy experiment, as seen from the rest system of the observer (Earth), therefore only demonstrates the (relativistically) trivial fact that for a zero angle of incidence (normal incidence) the angle of refraction is zero, too" (Wolfgang Pauli, *Theory of Relativity*, translated by G. Field, 1958, p. 114). Apparently, Einstein did not share the same casualness about Airy that Pauli did. Pauli seems to have both forgotten that neither the "observer" nor the "Earth" are "at rest" in the Copernican system, and that a "zero" value to both incidence and refraction is precisely the reason Airy's experiment is so important, since, given the same incidence of starlight in both telescopes, only the Earth's velocity would have made the starlight hit the side of the telescope. Moreover, it would be rather difficult for Relativity to explain stellar aberration on the basis of the limited speed of light, since without ether, Relativity must understand light as a scalar phenomenon (*i.e.*, it has a speed but no definite direction, and thus the speed is everywhere the same), not a vector (*i.e.*, a definite speed in a definite direction). As such, Relativity will see the star rotate rather than exhibit an aberration. Other attempts to explain Airy's failure use the Fitzgerald contraction hypothesis, that is, the telescope shrank in the direction it was moving, or that the telescope expanded in the direction perpendicular to its movement. It may be no coincidence that the Fitzgerald contraction predicts the same result for Airy's experiment as the Fresnel drag. Thus, as Bouw notes: "Physically speaking, it they are real, both effects must be contributing so that in actuality we must either conclude that Fresnel drag and the Fitzgerald contraction are one and the same thing or else that

The Experiment of Martinus Hoek

Just three years before Airy's entrance, Martinus Hoek, an astronomer at Utrecht, performed another type of experiment, but one that had demonstrated the same results as Airy, namely, that the Earth was not moving.[761] In 1868 he created a variation of Fizeau's experiment in order to test the nature of light. Up until this time, the use of laboratory light by Fresnel and Fizeau had yet to be answered, and thus the Copernicans retained hope that they could protect their cherished cosmology. In his apparatus, Hoek split a light beam so that it would travel in opposite directions, and he had the beams travel through both water and air. Again, since light travels slower in water, then, as the light beams meet back at the starting point, one beam will come in slower than the other and cause "fringes" on the receiving plate, that is, alternating light and dark patterns. Working on the idea that as the Earth moved through space it was doing so against the ether (which creates friction against the light and which Fresnel described as a "drag"), if the apparatus of Hoek's experiment were turned in the direction of the Earth's movement, and then subsequently perpendicular to it, there should not only be fringes but a noticeable *shifting* of the fringes. Hook's apparatus:

See next page

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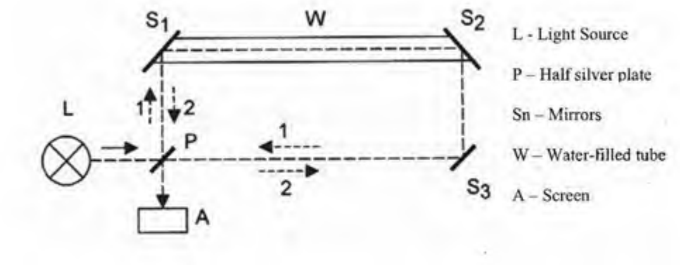
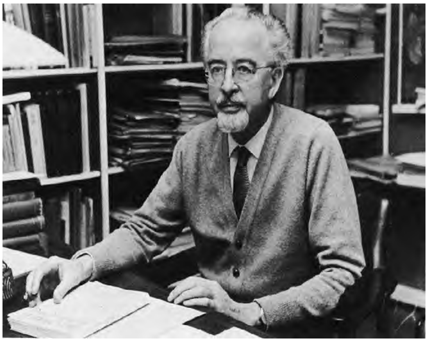
one effect or the other, but not both, is in operation. If the Fitzgerald contraction is removed then the only conclusion left is that the earth is standing still; otherwise, if Fresnel drag is removed, the question remains as to why Fresnel drag is observed in the laboratory but not in this analogous case. The simplest solution is that the earth is at rest, immobile, in absolute space" (*Geocentricity*, p. 244).

[761] Martinus Hoek, "Determination de la vitesse avec laquelle est entrainée une onde lumineuse traversant un milieu en mouvement," *Arch. Neerl*., 1868, 3, pp. 180-185; and 1869, 4, pp. 443-450. Prior to Hoek, M. Babinet performed another form of the experiment, and a few years later Ernst Klinkerfues had also performed similar experiments to Hoek's with the same results (*Die Aberration der Fixsterne nach der Wellentheorie*. Leipzig: Von Quandt and Händel, 1867), cited in *The Proceedings of the Royal Society*, vol. xx, 1871, pp. 35-39. Mascart makes reference to Babinet in M. Mascart, "Sur les modifications qu'éprouve la lumière par suite du mouvement de la source lumineuse et du mouvement de l'observateur," *Annales Scientifiques de l'École Normale Supérieure* Sér. 2, 1, 1872, pp. 157-214.



As **C. Møller** describes it:

> A measurement of the velocity of light in transparent substances seems to offer a new possibility for a determination of the absolute motion of the earth. An experiment of this kind was performed in 1868 by Hoek who used an interferometer arrangement of…a monochromatic light ray from a source of light…divided by a (weakly silver-coated) glass plate….



> Even if the whole apparatus were at rest in the ether, such an arrangement would give rise to interference fringes in the telescope, since the slope of the mirrors cannot possibly be adjusted so accurately that two rays 1 and 2 which focus on the same point in the telescope have traversed a path exactly the same optical length. However, if the whole apparatus has a velocity *v* with respect to the ether, this will cause an extra phase difference ΔF between the rays 1 and 2…[762]

To his surprise, Hoek noticed no significant difference in the fringes, at least not in accord with an Earth moving 30 km/sec. The obvious interpretation of this experiment is that Earth is not moving through the ether. Similar to Airy's eventual experience, we could call this experiment: "Hoek's failure."[763]

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[762] C. Møller, *The Theory of Relativity*, p. 17.

The Experiment of Eleuthère Mascart

Still another experiment was performed just one year after Airy's findings to test for the motion of the Earth. In 1872 Eleuthère Elie Nicolas Mascart devised an experiment in which he could detect the motion of the Earth through ether by measuring the rotation of the plane of polarization of light propagated along the axis of a quartz crystal. Polarization is a phenomenon of white light, which propagates along the axis of forward movement at many different angles but is reduced to just one angle. Polarizers are filters containing long-chain polymer molecules that are oriented in one specific position. As such, the incident light vibrating in the same plane as the polymer molecules is the only light absorbed, while light vibrating at right angles to the plane is passed through the polarizer. Mascart set up the experiment so that if the Earth were passing through the ether at the expected clip of 30 km/sec, then the light's plane of polarization would be affected. Mascart found no such results. His experiment was just another indication that Earth was not moving.

Prior to these events, in 1809 Carl Gauss had published his *Theoria Motus Carporum Cælestium*, which predicted the orbit of the asteroid Ceres, thus suggesting (as Galileo once did with Jupiter's moons), that smaller bodies rotated around larger ones. Further claims to have proof of the Copernican system were advanced by Frederich Bessel in 1838 as he finally discovered the long-awaited stellar parallax. In 1843, John C. Adams, and later Urbain Leverrier in 1846, used Newtonian mechanics to predict the orbit of Neptune. In 1851 Jean Foucault published his experiments on the pendulum. All of these events were leaning toward the adoption of the Copernican system, yet none of them provided any real proof. Since no one, including Copernicus and Galileo, had ever proved that the Earth was moving, then as long as there was the possibility of explaining these experiments by assuming a non-moving Earth, then modern science was at a crossroads. But the pressure was mounting against the Copernicans, for Hoek countered Fresnel, and Airy countered Bradley and Fizeau, and Mascart put the icing on the cake. So now, even though the science community was silent, geocentrism was the unconquerable foe of the Copernicans. As van der Kamp observes:

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[763] Heliocentric explanations to Hoek's result are quite presumptuous. As Walter van der Kamp states: "It is not difficult to see the conclusion that Hoek thought he could draw from this null result. Whatever speed *v* of the ether relative to the Earth we have decided to believe in, be it a few centimeters or many kilometers – we cannot demonstrate that speed" (*De Labore Solis*, p. 32). That is, Hoek and his colleagues just assumed the Earth was moving at 30 km/sec without ever demonstrating such movement. Van der Kamp also chides heliocentrist J. D. van der Waals' comments on Hoek's experiment. Van der Walls writes: "To perform the test he did not have to take great pains to give the whole apparatus a sufficient speed…The Earth by means of her rotation and annual orbit around the sun, provided a speed that was vastly greater than could have been obtained in any other manner…If the ether carrying the light moves with a velocity *w*…then we find $w = v(\eta^2 - 1/\eta^2)$, which is exactly the ether velocity according to Fresnel" (*Ober den wereldether*, Haarlem, Erven Bohn, 1929, pp. 81). Of course, as van der Kamp points out, this only begs the question, for if the Earth is not moving, then $v = 0$, and if that is the case then $w = 0$, and we have mathematical formulas that don't amount to anything.

> Hence it can be argued that Fresnel's theory holds for transparent substances moving through an ether at rest in that ether. Which is tantamount to saying that Hoek and Airy (observer and substance both at rest), Fizeau (observer at rest, substance in motion) and Michelson and Morley, all five of them have with one accord been vainly striving to show that the Earth is not at rest.

The 1881 Michelson Experiment

So now we have a better picture of the circumstances that led to the Michelson-Morley experiments. To save the world from having to "scuttle the Copernican theory," just a few years after George Airy's experiment Albert Michelson invented a somewhat sophisticated piece of equipment to test Airy's results.[764] The interferometer he assembled was similar to

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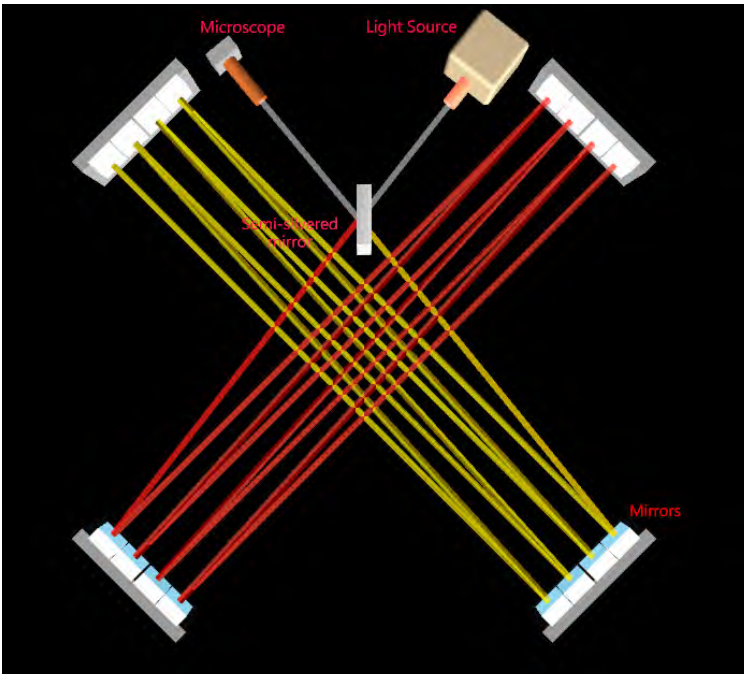
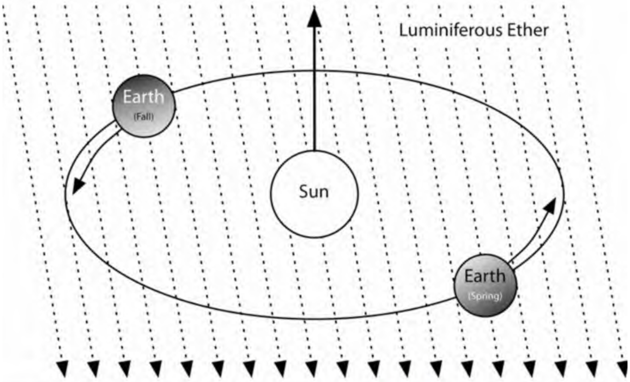
[764] Another impetus for Michelson was James Clerk Maxwell. After establishing his electromagnetic theory of light, Maxwell designed and performed an experiment for the purpose of detecting the Earth's motion through the ether. Not surprisingly, Maxwell found a null result. He reported the results to Stokes in 1864 and readied a paper for publication in the *Proceeding of the Royal Society*. Stokes informed Maxwell that Arago had already performed such an experiment and that Fresnel accounted for Arago's null results by means of the "drag" formula. Maxwell then withdrew his paper. Shortly before his death, Maxwell posted an article for the ninth edition of the *Encyclopedia Britannica* under the title "Ether," in which he argued that the only way to measure the Earth's velocity in the ether is to observe variations in the velocity of light traveling between two mirrors. A letter Maxwell wrote to astronomer D. P. Todd (1855-1939) inquiring

Hoek's but it was built a little better and was more accurate, yet it was very sensitive to vibration and heat and therefore its results could be thrown off a bit. Nevertheless, if the Earth were moving through ether this machine was designed to detect it.


Microscope
Light Source
Semi-silvered mirror
Mirrors


Luminiferous Ether
Earth
(Fall)
Sun
Earth
(Spring)

Heliocentric View of Ether Flow

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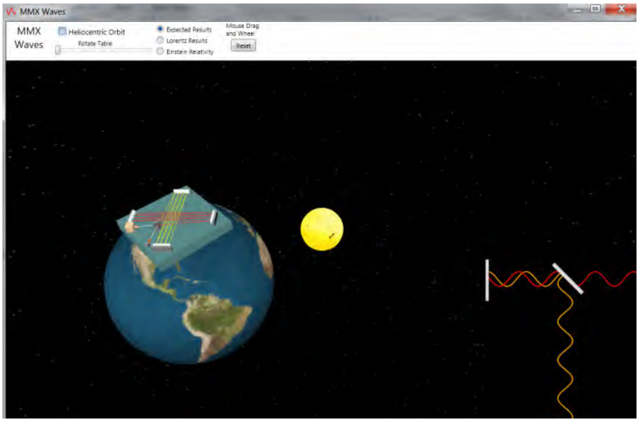
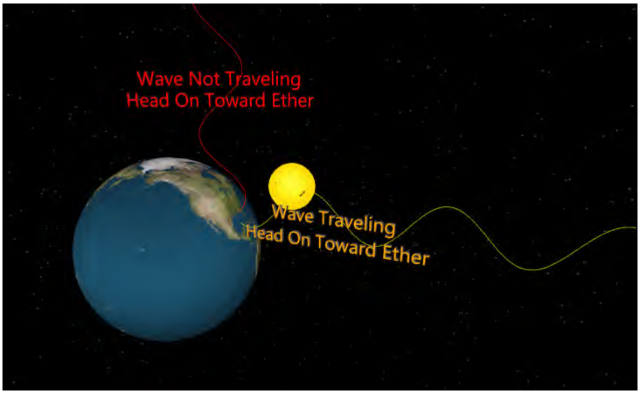
about these issues was published in *Nature*, which was the very letter that inspired Michelson to take up Maxwell's challenge.


MMX Waves
MMX
Waves
Rotate Table
Mouse Drag
and Wheel
Reset

☐ Heliocentric Orbit

● Expected Results
○ Lorentz Results
○ Einstein Relativity

Presumed rationale for Michelson-Morley experiment: apparatus revolves with Earth around the Sun[765]


Wave Not Traveling
Head On Toward Ether
Wave Traveling
Head On Toward Ether

Presumed results of Michelson-Morley experiment: waves heading into the ether contract with waves not heading into the ether, and form fringes[766]

The idea was to split a light beam into two beams and send them in perpendicular directions, which beams are then reflected back and recombined on a photographic plate. The distances traveled by the beams are not the same, thus the waves from the two beams will not be in synch, producing a pattern of **light and dark fringes** after they recombine. These fringes prove that the principle behind the interferometer works since non-synchronous light waves will produce fringes. Identical to Hoek's experiment, Michelson's procedure was to turn the table slightly and periodically on which the interferometer rested. The speeds of the two beams with respect to the ether will thus change and so will the times taken for the beams to recombine. Because troughs and crests of the light waves would not match up the same as in a non-rotating table, the original fringes would shift in their pattern of bright and dark lines.

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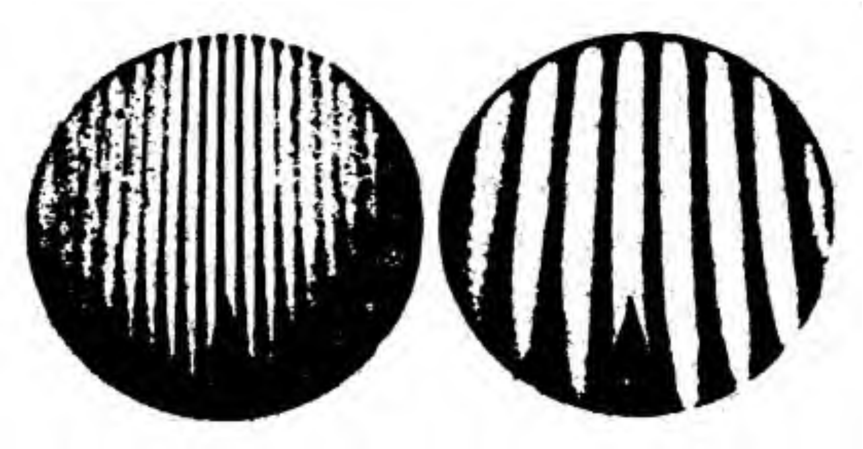
[765] See CDROM Animation.

[766] See CDROM Animation.



Light and dark fringe shifts caused by non-uniform light waves

As Charles Lane Poor puts it:

> Light waves vibrate, or follow one another, at a rate of about six hundred thousand billion a second; and it was this interval of time that Michelson used to measure the relative retardations of the waves traveling in the two directions….In any one fixed position of the apparatus…an observed retardation of one ray over the other might be the indication merely of instrumental errors of adjustment, errors in the length of arms, in the alignment of the mirrors, or in the direction of the instrument as a whole. But if the apparatus be rotated so that the arms take up various positions with respect to the [ether] drift, then the retardations due to instrumental errors will be eliminated, and that due to the drift will show up.[767]

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[767] Charles Lane Poor, *Gravitation versus Relativity*, 1922, pp. 14, 16.

The first interferometer trial was in 1881. After Michelson drew up plans for the device and submitted them to a company in Berlin for construction, Alexander Graham Bell, famous for the invention of the telephone, provided the needed funds. Michelson had not met Edward Morley as yet and thus he worked alone. Lo and behold, when Michelson performed the experiment he did not see a significant shifting of fringes, at least not those he was expecting. Using a 600 nanometer wavelength of light, Michelson expected to see fringe shifts (or, as he called them, "displacement of the interference bands") of at least 0.04 of a fringe width. The 0.04 figure corresponds to an Earth moving at 30 km/sec around the sun. If this was combined with what Michelson believed was the solar system's apparent movement toward the constellation Hercules, the fringes should have shifted on the order of 0.10 of a fringe width. But Michelson didn't see any fringe shifting close to either value. He writes:

> The interpretation of these results is that there is no displacement of the interference bands. The result of the hypothesis of a stationary ether is thus shown to be incorrect, and the necessary conclusion follows that the hypothesis is erroneous. This conclusion directly contradicts the explanation of aberration which has been hitherto generally accepted, and which presupposes that the Earth moves through the ether, the latter remaining at rest.[768]

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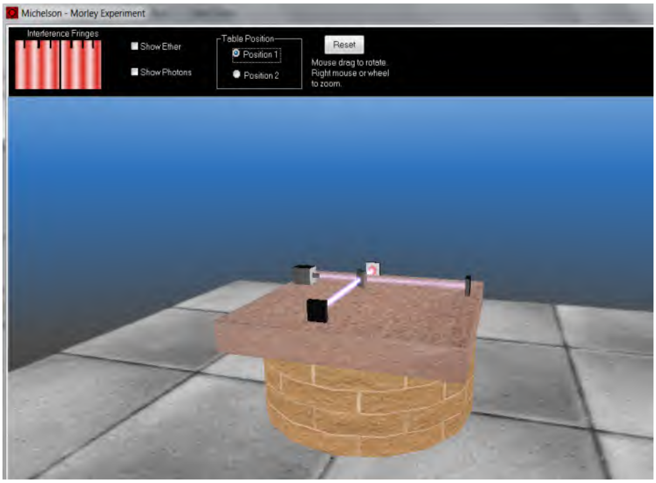
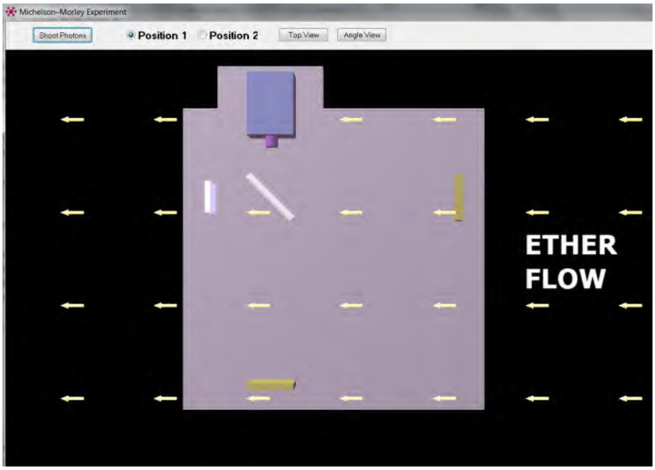
[768] Albert A. Michelson, "The relative motion of the Earth and the Luminiferous ether," *The American Journal of Science*, Vol. 3, No. 22, 1881, p. 128. As regards the Earth's supposed movement around the sun, in 1881 Michelson expected a fringe shift of 0.04 but got 0.02. In 1882, Hendrik Lorentz examined Michelson's results and determined them "to be in error," and Michelson conceded to this judgment in 1887. As Arthur Miller writes: "…Lorentz pointed out a calculation error committed by Michelson in his data analysis: Michelson had calculated the time required for the light ray to traverse the interferometer arm normal to the direction of the Earth's motion to be $2l/c$, instead of $2l/c + lv^2/c^3$ [the exact result was $(2l/c\ (1/\sqrt{1-v^2/c^2})$]. The extra term, Lorentz continued, reduced the calculated fringe shift by a factor of two, thereby placing any effect beyond Michelson's experimental accuracy; so Michelson's data ruled out neither Fresnel's theory nor the hybrid theory composed of elements of Fresnel's and Stokes' theories" (Arthur Miller, *Albert Einstein's Special Theory of Relativity*, p. 23). Despite the discrepancy pointed out by Lorentz, the fact is that the 1881 results, although a little exaggerated, show the same principle results as the 1887 experiment – there is an ether drift, regardless how small.


Michelson - Morley Experiment
Interference Fringes
Show Ether
Show Photons
Table Position
Position 1
Position 2
Reset
Mouse drag to rotate. Right mouse or wheel to zoom.

Simplified Michelson-Morley experiment with fringe-shifting meter[769]

Notice, for future reference, that Michelson did not say there was *no* displacement of the interference bands, but that the "*interpretation* of these results is that there is no displacement of the interference bands." Obviously, if you are looking for fringe shifting on the order of 0.10 but you get results that are 0.040 of a fringe width, you would be inclined to say there was "no displacement of the interference bands."


Michelson–Morley Experiment
Shoot Photons
Position 1
Position 2
Top View
Angle View
ETHER FLOW

Simplified Michelson-Morley experiment with ether flow[770]

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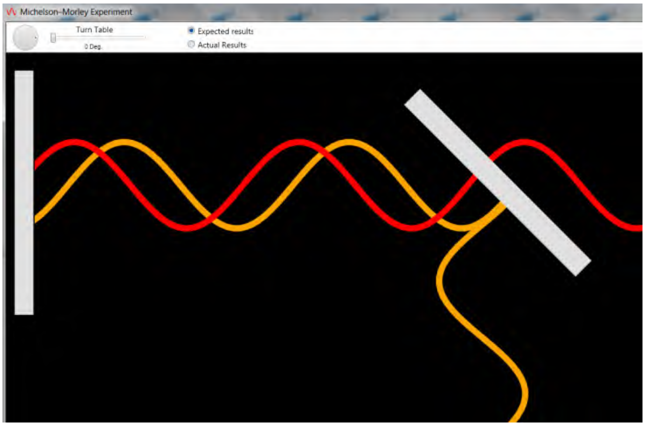
[769] See CDROM for Animation.
[770] See CDROM for Animation.

Notably, in the above quote from his 1881 experiment Michelson makes reference to the same "stellar aberration" phenomenon over which Einstein would later be concerned. This shows that Michelson had his heart set on confirming or denying the experimental results of George Airy and Armand Fizeau. Unfortunately for the heliocentrists, Michelson only confirmed Airy's results and, in the process, overturned the hypothesis of Fresnel and Fizeau, who claimed that the Earth moved through space at 30 km/sec and was doing so against the ether, which creates friction against a light beam pointed in the same direction, and which would thus decrease the speed of the light beam.

Michelson's experiment, as he says himself, also overturned the idea that "the Earth moves through the ether." On the surface, this is a rather amazing admission by Michelson. Perhaps he did not realize what he had said; nevertheless, there it is. He did not say that the ether did not exist; rather, he said Earth does not move through the ether. Fresnel had "presupposed" that the Earth moved at 30 km/sec through ether, but Michelson's results said no. At this point Michelson was being very honest with his own results. Let us remember Michelson's original interpretation as we move on in this saga.

The 1887 Michelson-Morley Experiment

Perhaps Michelson was so astounded at his 1881 results and the interpretation he was forced to admit ("This conclusion directly contradicts…[the idea] which presupposes that the Earth moves through the ether") that he had to do the test again just to make sure he could convince himself to believe what his own eyes were showing him, and to reassure every other concerned physicist that this experiment was not a fluke. After attending a series of lectures by William Thomson (aka Lord Kelvin) in 1884, Michelson's interest in redoing the 1881 interferometer experiment was sparked. Michelson secured financial aid from the Bache Fund of the National Academy of Sciences. This involvement reveals that many influential people were intently anticipating the results. Michelson, and his newfound partner Edward Morley, created a new instrument for the occasion, which was much more accurate and not so easily upset by environmental factors. (People walking at a distance of 100 yards from the interferometer disturbed Michelson's 1881 apparatus). Michelson and Morley increased by eightfold the length the light had to travel in contrast to the 1881 machinery. They even put their new interferometer in a pool of mercury so that it could be rotated without causing any vibration. They secured an adequate basement facility at Case Western University. With these improved conditions, Michelson and Morley now expected to see an interference pattern equal to 0.40 of a fringe width as opposed to the 0.1 he expected in 1881.



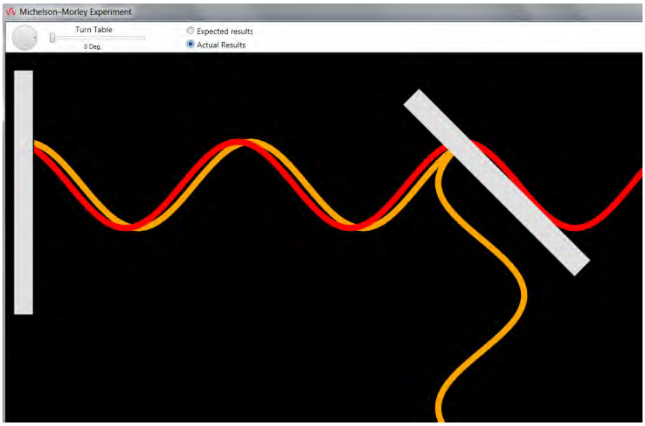
Turn Table 0 Deg.

● Expected results

○ Actual Results

Expected results: significant separation of waves if Earth is revolving around the sun

As they rotated the apparatus in the mercury pool in increments of 1/16th of a turn, their assistant would write down the fringe shift values Michelson calibrated from graduated markings in the eyepiece. To his surprise, Michelson did not find what he expected.



Turn Table 0 Deg.

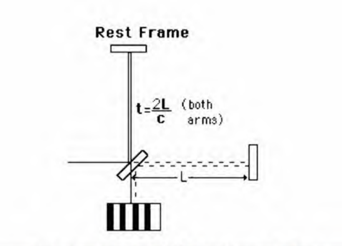
○ Expected results

● Actual Results

Actual results: small separation of waves. Viable interpretation: Earth is not moving

The experiment was repeated a number of times, but regardless of location, season, elevation, or orientation of instruments Michelson found the results were the same as the 1881 experiment, within a reasonable margin of error. As Michelson records it:

> Considering the motion of the Earth in its orbit only, this displacement should be 2D v^2/V^2 = 2D × 10^{-8}. The distance D was about eleven meters, or 2 × 10^7 wavelengths of yellow light; hence, the displacement to be expected was 0.4 fringe. The actual displacement was certainly less than the twentieth part of this, and probably less than the fortieth part. But since the displacement is proportional to the square of the velocity, the relative velocity of the Earth and the ether is probably less than one-sixth the Earth's orbital velocity, and certainly less than one-fourth.[771]



Michelson-Morley 1887 Experiment At Rest

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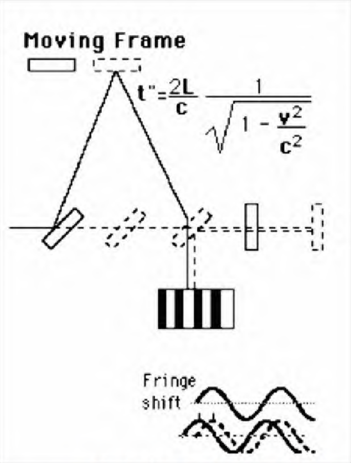
[771] A. A. Michelson and E. W. Morley, "On the Relative Motion of the Earth and the Luminiferous Ether," Art. xxxvi, *The American Journal of Science*, eds. James D and Edward S. Dana, No. 203, vol. xxxiv, November 1887, p. 341. As one textbook calculates it: "$\Delta t - \Delta t' = (l_1 + l_2)\, v^2/c^3$. Now we take $v = 3.0 \times 10^4$ m/s, the speed of the Earth in its orbit around the Sun. In Michelson and Morley's experiment, the arms l_1 and l_2 were about 11 m long. The time difference would then be about $(22\text{m})(3.0 \times 10^4 \text{ m/s})^2/(3.0 \times 10^8 \text{ m/s})^3 \approx 7.0 \times 10^{-16}$ s. For visible light of wavelength $\lambda = 5.5 \times 10^{-7}$ m, say, the frequency would be $f = c/\lambda = (3.0 \times 10^8 \text{ m/s})/(5.5 \times 10^{-7} \text{ m}) = 5.5 \times 10^{14}$ Hz, which means that wave crests pass by a point every $1/(5.5 \times 10^{14} \text{ Hz}) = 1.8 \times 10^{-15}$ s. Thus, with a time difference of 7.0×10^{-16} s, Michelson and Morley should have noted a movement in the interference pattern of $(7.0 \times 10^{-16} \text{ s})/(1.8 \times 10^{-15} \text{ s}) = 0.4$ fringe. They could easily have detected this, since their apparatus was capable of observing a fringe shift as small as 0.01 fringe. But they found no significant fringe shift whatever….Never did they observe a significant fringe shift. This 'null' result was one of the great puzzles of physics at the end of the nineteenth century" (*Physics: Principles with Applications*, Fourth Edition, Douglas C. Giancoli, 1995, p. 749). Notice that the author does not say there was no fringe shift, but that there was no "significant fringe shift."



Michelson-Morley 1887
Experiment With Relative Motion

In a letter to **Lord Rayleigh** (aka John William Strutt), he states it more simply:

> The experiments on relative motion of earth and ether have been completed and the result is decidedly negative. The expected deviation of the interference fringes from the zero should have been 0.40 of a fringe – the maximum displacement was 0.02 and the average much less than 0.01 – and then not in the right place. As displacement is proportional to squares of the relative velocities it follows that if the ether does slip past [the Earth] the relative velocity is less than one sixth of the Earth's velocity.[772]

So here we see that, although his 1881 results would not allow anyone to "presuppose that the Earth was moving through the ether," it is just this that Michelson is presupposing to interpret his 1887 experiment. This shows how ingrained the idea of an orbiting Earth was in the minds of scientists only two centuries from the Galileo affair in the 1600s. It was the foundation from which they interpreted everything in the cosmos. Finding interference patterns of only hundredths of a fringe rather than half a fringe meant that someone had to come up with a convincing explanation, or Michelson and company might have to stop making such grandiose "presuppositions."[773]

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[772] Letter dated August 17, 1887, from the Rayleigh Archives, cited in Dorothy M. Livingston, *The Master of Light: A Biography of Albert A. Michelson*, 1973, p. 130.

Again, as we noted earlier, here was additional evidence, from an even more sophisticated machine specifically designed to vindicate Copernicus, Galileo, Kepler and Newton, yet it failed, miserably failed. Unfortunately, the scientists interpreting Airy, Hoek and Michelson-Morley simply did not want to consider a motionless Earth as even a possible solution to these astounding experiments. They "knew" the Earth revolved around the sun and thus they set their heart toward finding other solutions to the problem. As noted earlier, Einstein's biographer describes it thus:

> In the United States Albert Michelson and Edward Morley had performed an experiment which confronted scientists with an appalling choice. Designed to show the existence of the ether, at that time considered essential, it had yielded a null result, leaving science with the alternatives of tossing aside the key which had helped to explain the phenomena of electricity, magnetism, and light *or of deciding that the Earth was not in fact moving at all.*[774]

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[773] In *The Ethereal Ether*, Loyd Swenson summarizes Michelson's options as: "1. The Earth passes through the ether without appreciable influence; 2. The length of all bodies is altered (equally?) by their motion through ether; 3. The Earth in its motion drags with it the ether even at distances of many thousands of kilometers from its surface" (Austin, University of Texas, 1972, p. 118, cited in *De Labore Solis*, p. 36, parenthetical "equally" included by Michelson). Van der Kamp remarks: "…this lifelong agnostic…Michelson…appears on one issue not in the least agnostic, but as firmly a fundamentalist Copernican believer…There is no place in Michelson's only partially agnostic tunnel-vision for possibility Number Four [*i.e.*, that Earth is motionless in space]…Yet…a geocentric explanation of the enigmas encountered…stares…any open-minded down-to-Earth scientist in the face when he surveys all those abortive efforts to disqualify it…In Michelson's heliocentrically preconditioned mind the obvious corollary, a simple straightforward geocentric hypothesis, did not get a chance to rear its unwanted head…Michelson searched for and found those three helpful *ad hocs*, three pretexts able to ward off a disturbing and unwanted perspective" (*ibid*. pp. 36-42).

[774] *Einstein: The Life and Times*, p. 57, emphasis added.

If they were set on refusing to consider that the Earth was standing still in space, this left them with two more options to explain its results. As Clark records it:

> The second was that the ether was carried along by the Earth in its passage through space, a possibility which had already been ruled out to the satisfaction of the scientific community by a number of experiments, notably those of the English astronomer James Bradley. The third solution was that the ether simply did not exist, which to many nineteenth century scientists was equivalent to scrapping current views of light, electricity, and magnetism, and starting again.[775]

Henri Poincaré, one of the world's most respected physicists, compared it to a "crisis."

> Are we about to enter now upon the eve of a second crisis? These principles on which we have built all, are they about to crumble away in their turn? ….Alas…such are the indubitable results of the experiments of Michelson.[776]

Henri Poincaré (1854 – 1912)

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[775] *Einstein: The Life and Times*, p. 110.

[776] Henri Poincaré, "The Principles of Mathematical Physics," *The Monist*, vol. XV, January 1905, pp. 6, 20.

It is ironic that Poincaré would describe the problem as a "second crisis," since the context of his paragraph shows that the "first crisis" he has in view is the Copernican revolution. The irony is that the "second crisis" was now bringing science back to consider that it made a wrong decision during the "first crisis." In essence, the Michelson-Morley experiment trapped science like the proverbial rat in the corner. Nothing less than the total revamping of physical science could satisfy the demands of these experiments if, indeed, a motionless Earth was not considered an option. As Van der Kamp puts it: "That is to say: nothing less than a premise capable of turning all evidence favoring a geocentric universe into evidence for an a-centric homogenous one will suffice."[777] Eventually this revamping of science would lead to Einstein's Special Relativity theory, but there were stops along the way to set the stage for his arrival.

Fitzgerald/Lorentz's Incredible Shrinking Machine, Phase I

In 1892 Hendrik Lorentz wrote to Lord Rayleigh and expressed his consternation at the results of the Michelson-Morley experiment:

> I am totally at a loss how to solve the contradiction and yet I believe that if Fresnel's wave theory is abandoned, we should have no adequate aberration theory at all….Can there be some point in the theory of Mr. Michelson's experiment which has as yet been overseen? [sic].[778]

Hendrik Lorentz (1853-1928)

We see what is at stake. As Einstein himself would recognize, the Michelson-Morley experiment is not only showing that there is no movement of the Earth against ether, it is denying to the heliocentrists the only explanation available (Fresnel's wave theory) to deal with the results of Airy's failure. If they cannot use Fresnel to answer Airy and the other aberration experiments, then they would have to resign themselves to admitting that the Earth is motionless in space. A solution had to be found. Clark explains what it was:

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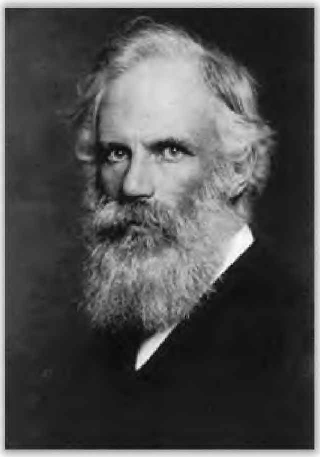
[777] *De Labore Solis*, p. 44. Later he writes: "…astronomy books, misleading as – courtesy of Albert Einstein – their heliocentric illustrations and explanations are, seldom or ever spell out the a-centric concept to which the Copernican revolution has inevitably led" (*ibid*., p. 112).

[778] Letter dated August 18, 1892, from the Lorentz microfilm at the Niels Bohr Library, New York, as cited in Dorothy Michelson Livingston's *The Master of Light: A Biography of Albert A. Michelson*, p. 131.

> The only other explanation must surely lie in some perverse feature of the physical world which scientists had not yet suspected, and during the next few years this was sought by three men in particular George Fitzgerald... Hendrik Lorentz ...and Henri Poincare. The Fitzgerald explanation came first. To many it must have seemed that he had strained at a gnat and swallowed an elephant. For while Fitzgerald was unwilling to believe that the velocity of light could remain unaffected by the velocity of its source, he suggested instead that all moving objects were shortened along the axis of their movement. A foot rule moving end forwards would be slightly shorter than a stationary foot rule, and the faster it moved the shorter it would be.[779]



George F. Fitzgerald (1851 – 1901)

A November 10, 1894 letter from Lorentz to Fitzgerald shows that the Michelson-Morley experiment was driving them to these positions:

> My dear Sir, in his “Aberration Problems” Prof. Oliver Lodge mentioned a hypothesis *which you have imagined in order to account* for the negative result of Mr. Michelson’s experiment.[780]

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[779] *Einstein: The Life and Times*, p. 110.

[780] Draft copy in Algemeen Rijksarchief, The Hague, published by Stephen G. Brush, in *Note on the History of the Fitzgerald-Lorentz Contraction*, Isis, 58:231,

"Imagination," indeed. Fitzgerald revealed this imaginative "hypothesis" to Oliver Lodge in early 1892 on a visit to Liverpool. He told him the following:

> Well, the only way out of it that I can see is that the equality of paths must be inaccurate; the block of stone must be distorted, put out of shape by its motion…the stone would have to shorten in the direction of motion and swell out in the other two directions.[781]

On May 27, 1892, Lodge made it known to the public that "Professor Fitzgerald has suggested *a way out of the difficulty* by supposing the size of bodies to be a function of their velocity through the ether."[782] Lodge proceeded to give an example of Fitzgerald's hypothesis. According to Lodge, a length of 8,000 miles (approximately the diameter of the Earth), would have to be shortened only 3 inches in order to account for the null result of the Michelson-Morley experiment.[783] On the one hand, since 3 inches seemed to be such a trivial length, it wouldn't take much to adjust the mathematics to make it fit into the physical measurements. On the other hand, since 3 inches is minute compared to 8,000 miles, it shows how precise the Michelson-Morley experiment really was, and it was a preciseness that simply would not go away, since the same ratios showed up in virtually every interferometer experiment performed for the next several decades.

Oliver Lodge (1851-1940)

In any case, we see clear evidence that, in refusing to accept the possibility of a motionless Earth, yet having to come up with a plausible

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1967; emphasis added; cited in Holton's *The Thematic Origin of Scientific Thought*, pp. 328, 364.

[781] Archived in "Report of Activities of the Physical Society," *Nature*, vol. XLVI (1891), p. 165, as cited in Dorothy Michelson Livingston, *The Master of Light*, p. 132.

[782] Oliver Lodge, "On the Present State of Knowledge of the Connection between Ether and Matter: A Historical Summary," *Nature*, 46:164-165, 1892; emphasis added, cited in Holton's *Thematic Origins of Scientific Thought*, pp. 328, 364.

[783] As reported to the *Royal Society of London, Philosophical Transactions* under the title "Aberration Problems," vol. 184-A (1893), pp. 749-750.

answer to the "null" results of the Michelson-Morley experiment, physics was resigned to opt for the absurd hypothesis that matter was mysteriously squeezed as it moved. Fitzgerald was forced to this position since he had to answer why, if Earth was moving 18.5 miles per second, that a light beam discharged in the same direction as Earth's movement arrived at its destination at the same time that a beam discharged perpendicular to the Earth's movement arrived at the same destination. Michelson's equipment was sensitive enough to calibrate an ether wind speed of 1 mile per second, which was obviously 18.5 times more sensitive than the Earth supposedly moving through the ether.[784]

To be consistent with his newfound hypothesis, Fitzgerald was required to posit that the test instruments must adjust in the same way, truncating their length as they were turned into the direction of the Earth's movement around the sun. Incidentally, this "contraction" solution would also be employed to explain stellar aberration, since Fitzgerald could claim that as the Earth traveled at 66,000 mph the telescope would alter in length and thus receive starlight in altered forms: one form for when the Earth was receding from the star and another when it was moving toward the star.

The reader is reminded that, despite Airy's discovery that there is no difference in the incidence of starlight on two respective telescopes (thereby discounting stellar aberration as a proof for heliocentrism), stellar aberration is still a natural phenomenon that always occurs when one views a star over the course of several months. As such, it must be explained. For those who accepted an ether-filled space between Earth and the stars, appealing to Fresnel "drag" was one attempt to explain stellar aberration, and the Fitzgerald "contraction" was another. In both cases the Earth is understood to be moving through motionless ether. But as we have seen earlier, Fresnel's theory is discounted by Airy's "failure," which leaves only Fitzgerald's theory. But as Clark shows, initially it was not well received:

> For some years this explanation appeared to be little more than a plausible trick. 'I have been rather laughed at for my view over here,' Fitzgerald wrote to Lorentz from Dublin in 1894.[785]

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[784] In fact, based on light's wavelength of 5×10^{-7} meters, the Michelson-Morley experiment was supposed to be sensitive enough to detect not only the revolution of the Earth around the sun (18.5 mps; 66,600 mph; or 30 km/s) but also the rotation of the Earth (300 m/s at the longitude of the experiment). As history shows, it detected neither.

[785] *Einstein: The Life and Times*, p. 111.

But when Fitzgerald learned of Lorentz's support for the hypothesis, he suddenly changed his tune and wrote these words:

> My dear Sir, I have been preaching and lecturing on the doctrine that Michelson's experiment proves, and is one of the only ways of proving, that the length of a body depends on how it is moving through the ether…Now that I hear you as an advocate and authority I shall begin to jeer at others for holding any other view.[786]

Obviously, Fitzgerald was "laughed at" because his solution seemed all too convenient. As physicist Dennis Sciama notes about similar acts of desperation in science:

> No one would take this theory seriously, of course. One reason for this, no doubt, would be the obviously *ad hoc* and, indeed, ludicrous appearance of the theory. But the fundamental reason for objecting to the theory is that the demons cannot be observed *except through the very phenomenon they were invented to explain*. The introduction of the demon thus adds nothing to what we know already.[787]

Although Fitzgerald was "laughed at" for proposing his contraction theory, he probably would have been scorned or put in a straight jacket if he had proposed that the Earth was standing still in space. By now, Copernicanism was so much a part of the fabric of life that any *ad hoc* explanation of the Michelson-Morley experiment would probably have been accepted if people knew the alternative was believing in a motionless Earth. But the alternative was never told to them, for Fitzgerald, *et al*., did not want the common man even thinking about that possibility. In fact, once he received Lorentz's agreement, Fitzgerald considered the contraction hypothesis as scientific dogma, and he decided to do the "laughing" at others who disagreed with him. All that was needed now was to package Fitzgerald's idea in scientific garb and mathematical equations and it would instantly attain an air of prestige and intelligence. This task was left to Henrick Lorentz. As he puts it:

> The first example of this kind is Michelson's well-known interference experiment, the negative result of which has led

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[786] Holton, *Thematic Origins*, p. 331.

[787] Dennis Sciama, *The Unity of the Universe*, 1961, p. 103, emphasis his.

> Fitzgerald and myself to the conclusion that the dimensions of solid bodies are slightly altered by their motion through the ether.[788]

As Ronald Clark describes it:

> Lorentz had been among the first to postulate the electron, the negatively charged particle whose existence had finally been proved by J. J. Thomson at Cambridge. It now seemed to him that such a contraction could well be a direct result of electromagnetic forces produced when a body with its electrical charges was moved through the ether. These would disturb the equilibrium of the body, and its particles would assume new relative distances from one another. The result would be a change in the shape of the body, which would become flattened in the direction of its movement....Lorentz's invocation of electro-magnetism thus brought a whiff of sanity into the game. Here at least was a credible explanation of how a foot rule in motion could be of a different length from the foot rule at rest.[789]

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[788] H. A. Lorentz, "Electromagnetic Phenomena in a System Moving with any Velocity Less Than that of Light," in *The Principle of Relativity*, translated by W. Perrett and G. B. Jeffery from the 1923 first edition, 1952, p. 11. In another paper Lorentz adds: "For if we now understand by S_1 and S_2 not, as formerly, two systems of charged particles, but two systems of molecules – the second at rest and the first moving with a velocity v in the direction of the axis x – between the dimensions of which the relationship subsists as previously stated; and if we assume that in both systems the x components of the forces are the same, while the y and z components differ from one another by the factor $\sqrt{(1 - v^2/c^2)}$, then it is clear that the forces in S_1 will be in equilibrium whenever they are so in S_2. If therefore S_2 is the state of equilibrium of a solid body at rest, then the molecules in S_1 have precisely those positions in which they can persist under the influence of translation. The displacement would naturally bring about this disposition of the molecules of its own accord, and thus effect a shortening in the direction of motion in the proportion of 1 to $\sqrt{(1 - v^2/c^2)}$" (H. A. Lorentz, "Michelson's Interference Experiment," in *The Principle of Relativity*, trans. by W. Perrett and G. B. Jeffery from the 1923 first edition, 1952, p. 7).

[789] *Ibid.*, p. 111. Lorentz happened upon these equations in a paper by Woldemar Voigt written in 1887 on the Doppler effect (Über das Dopplersche Prinzip, Nachr. Ges. Wiss. Göttingen). Voigt came to his view by analyzing differential equations for oscillations in an incompressible elastic medium, which led to a set of transformation equations to support his theory of the converging or diverging of spherical forces. It wasn't until many years later that Lorentz acknowledged Voigt's primary work.

Being a firm believer in Relativity, Clark describes Lorentz's solution as a "whiff of sanity," but for those of us who are not as inclined toward such *ad hoc* speculations the "whiff" is more of a stench. Lorentz, by an explanation heretofore unimagined in common-sense science, is saying that matter shrinks when it moves, which is due to some internal structural change its atoms undergo by some unexplained electrical forces, caused by an ether which previously understood to be frictionless. Of course, Lorentz would have to exclude light from this natural contraction, and thus the full title of his 1904 paper became "Electromagnetic Phenomena in a System Moving *with Any Velocity Less than that of Light*."[790] As Louis Essen describes Lorentz's hypothesis:

> …moving particles gave rise to a magnetic field, thus disturbing the equilibrium of the forces binding the particles together and causing the length of any moving object to be reduced. The requirements of the electro-magnetic theory made it necessary for time to change in a similar way, and these assumptions led to the Lorentz transformations.[791]

Lorentz had no proof of this explanation but it certainly was a relief to a science community that up to this point was totally stymied by the results of optical experiments showing a motionless Earth. At least Lorentz's explanation was a much easier pill to swallow than bringing the human race back to pre-Copernican days. In essence, Lorentz created an equation that allowed the Earth's rest to appear as motion and no one was the wiser.

The completely *ad hoc* nature of the contraction hypothesis is made obvious by the diametrically opposed views of Fitzgerald and Lorentz. Herbert Dingle astutely pointed out that, although Fitzgerald's proposal has been commonly reported as a *contraction* of the longitudinal arm of the interferometer (the arm pointing toward the direction of the Earth's movement), Fitzgerald originally proposed that the width, not the length, of the longitudinal arm increased, and that the length of the transverse arm also increased (the arm at a right angle to the movement of the Earth). The only account of Fitzgerald's proposal is included in Lodge's book 1909 *The Ether of Space*, an account that he obtained by a personal interview with Fitzgerald.[792] Lorentz changed the phenomenon to one having the longitudinal arm decrease in length and the transverse arm decrease in width, and it was this version of the "contraction" that became the pair's best answer to the Michelson-Morley experiment.[793] Lorentz writes:

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[790] From the English version in the Proceedings of the Academy of Sciences of Amsterdam, 6, 1904, cited in *The Principle of Relativity*, p. 9, emphasis added.

[791] Louis Essen, *The Special Theory of Relativity – A Critical Analysis*, p. 4.

[792] Dingle's charge is confirmed as Lodge quotes Fitzgerald speaking of "when a block of matter is moving through the ether of space its cohesive forces across the line of motion are diminished, and consequently in that direction it expands."

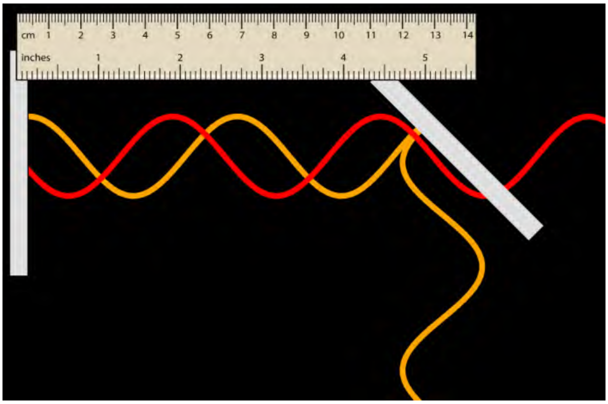
> We are therefore led to suppose that the influence of a translation on the dimensions (of the separate electrons and of a ponderable body as a whole) *is confined to those that have the direction of the motion*, these becoming times smaller than they are in the state of rest.[794]

Lodge records it as follows: "Hence, although there may be some way of getting round Mr. Michelson's experiment, there is no obvious way; and if the true conclusion be not that the ether near the earth is stagnant, it must lead to some other important and unknown fact. ¶ That fact has now come clearly to light. It was first suggested by the late Prof. G. F. FitzGerald, of Trinity College, Dublin, while sitting in my study at Liverpool and discussing the matter with me. The suggestion bore the impress of truth from the first. It independently occurred also to Prof. H. A. Lorentz, of Leiden, into whose theory it completely fits, and who has brilliantly worked it into his system. It may be explained briefly thus….¶ 'Atoms of matter are charged; and cohesion is a residual electric attraction. So when a block of matter is moving through the ether of space its cohesive forces across the line of motion are diminished, and consequently in that direction it expands, by an amount proportioned to the square of aberration magnitude. ¶ A light journey, to and fro, across the path of a relatively moving medium is slightly quicker than the same journey, to and fro, along. But if the journeys are planned or set out on a block of matter, they do not remain quite the same when it is conveyed through space; the journey across the direction of motion becomes longer than the other journey, as we have just seen. And the extra distance compensates or neutralizes the extra speed; so that light takes the same time for both" (Lodge, *The Ether of Space*, p. 69. Dingle says it appears on pp. 65-66).

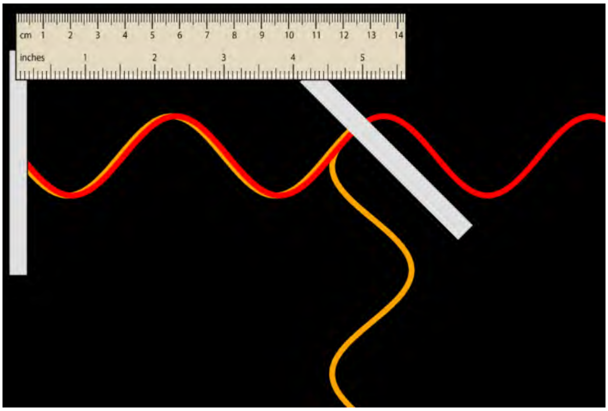
[793] Herbert Dingle, *Science at the Crossroads*, p. 163. Dingle adds: "Lodge's account, it is true, does not make it perfectly clear whether this is his explanation of the effect or FitzGerald's, but since he leaves no doubt that the fundamental idea was FitzGerald's, it is unlikely that he would change it without saying so, and in that case there is no such thing as the 'FitzGerald contraction'; it is the FitzGerald expansion, for, according to this explanation, it is not the longitudinal arm that is contracted but the transverse arm that is lengthened – the effect on the fringes, of course, being the same" (*ibid*., 163-164).

[794] "Electromagnetic Phenomena in a System Moving with any Velocity Less Than that of Light," in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, 1952, p. 28.

> There would result a contraction of the body in the direction of motion which is proportional to the square of the ratio of the velocities of translation and of light and which would have a magnitude such as to annul the effect of ether-drift in the Michelson-Morley interferometer.[795]



Expected results: waves are separated due to presumed motion of Earth; ruler at normal length



Contrived results: Lorentz Contraction claims waves coalesce because apparatus shrinks as Earth moves around the sun; ruler contracted

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[795] H. A. Lorentz, *Versuch einer Theorie der electrischen und optischen Erscheinungen in bewegten Körpern*, Leyden, 1895, cited in Miller's "The Ether Drift Experiment and the Determination of the Absolute Motion of the Earth," *Reviews of Modern Physics*, Vol. 5, July, 1933.

Lorentz was still in a bind, however. His 1886 paper "On the Influence of the Earth's Motion on Luminiferous Phenomena" dealing with the optical effects of bodies in motion, stated that it was possible for ether to be partially dragged. But Lorentz's theory of how electrons moved, which he introduced in the early 1890s, was based on the idea of an immobile ether. In this view, ether was understood to be totally separate from matter, and consequently, the only way ether and matter could interact was through infinitesimal charged particles, such as electrons, which generate electrical and magnetic fields in the ether, and which fields, in turn, exert forces on the electrons. Lorentz faced the very difficult task of explaining, based on his electron/immobile-ether theory, why optical experiments, such as those performed by Michelson-Morley, Hoek, Fresnel, Fizeau, Airy, *et al.*, failed to detect the Earth moving through an immobile ether. Fresnel had worked on the basis of "dragged" ether, and thus Lorentz had to derive Fresnel's formula from his new theory of electrons and electromagnetic propagation without admitting to an ether drag. His solution? In 1892, Lorentz claimed that the electromagnetic waves, not the ether, are partially dragged. Thus, the ether can remain immobile and the Earth can remain in motion, but while the Earth moves it brings some of the electromagnetic waves with it.[796] As one can see, the shell game of modern science continued and Lorentz became its premier magician, all in an effort to avoid having to admit to the audience the possibility that the Earth was standing still in space.

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[796] As Arthur Miller explains it, hoping to give it some respectability: "Lorentz (1886) used Huygens' principle and Fresnel's hypothesis to deduce the velocity of light that traversed a medium of refractive index N that was at rest where the source could have been either on the Earth or in the ether [which] explained Arago's experiment and an equivalent one by George Biddell Airy. Lorentz continued (1886), by noting that from the viewpoint of the geocentric system we could say that 'the waves are entrained by the ether' according to the amount – v/N^2. For consistency with the nomenclature of the time Lorentz defined v_r as the velocity of the 'relative ray' and c/N as the velocity of the 'absolute ray.' For example, in order to view the light from a fixed star, a telescope, or a system of aligned slits, at rest on the Earth had to be oriented in the direction of the relative ray because the relative ray was the direction in which energy was transported….On the other hand, an observer at rest in the ether measured the velocity of the light that was propagating through the medium at rest on the moving Earth to be $c' = u_r + v$…Lorentz noted that the ether-fixed observer could interpret [$c' = u_r + v$] as the 'entrainment of the light waves by the ponderable matter" (*Albert Einstein's Special Theory of Relativity*, pp. 19-20). Of course, even Einstein could see through this hodgepodge of *ad hoc* explanations, politely calling them "asymmetries which do not appear to be inherent in the phenomena," in his 1905 *Annalen der Physik* article. In the end, Lorentz was forced to admit: "Briefly, everything occurs as if the Earth were at rest, and the relative rays were the absolute rays" (*ibid.*, p. 20).

The issue was further obfuscated when physicists began creating different responses to explain the "contraction" solution. At one point Lorentz held: "Yes, it is as real as anything we can observe," to which Arthur Eddington retorted:

> When the rod in the Michelson-Morley experiment is turned through a right angle it contracts; that naturally gives the impression that something has happened to the rod itself. Nothing whatever has happened to the rod – the object in the external world. It's length has altered, but length is not an intrinsic property of the rod, since it is quite indeterminate until some observer is specified. Turning the rod through a right angle has altered the relation to the observer…but the rod itself, or the relation of a molecule at one end to a molecule at the other, is unchanged.[797]

But in another place he claims that the contraction is real, at least to one's eye: "…your retina has contracted in the vertical direction without your knowing it, so that your visual estimates of vertical length are double what they should be."[798] At another time Eddington said: "The shortening of the moving rod is *true*, but it is not *really true*."[799] In one of his more sober moments, however, he added: "...it was like the adventures of Gulliver in Lilliputland and Alice's adventures in Wonderland."[800] Albert

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[797] Arthur Eddington, *Space, Time and Gravitation*, p. 34.

[798] *Ibid*., p. 22.

[799] Arthur S. Eddington, *The Nature of the Physical World*, 1929, pp. 33-34, emphasis his. Other confusing statements include Wolfgang Pauli's: "It therefore follows that the Lorentz contraction is not a property of a single rod taken by itself, but a reciprocal relation between two such rods moving relatively to each other, and this relation is in principle observable" (Wolfgang Pauli, *Theory of Relativity*, 1958, pp. 12-13); and Herman Minkowski's: "This hypothesis sounds extremely fantastical, for the contraction is not to be looked upon as a consequence of resistances in the ether, or anything of that kind, but simply as a gift from above, – as an accompanying circumstance of the circumstance of motion" ("Space and Time," in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, 1952, p. 81).

[800] *Relativity, Time and Reality*, Harold Nordenson, 1969, p. 153. Jaffe adds: "To anyone accustomed to thinking in terms of the then recognizable truths of physics, Fitzgerald's theory was a sort of Mad Hatter's deduction" (Bernard Jaffe,

Michelson didn't buy it either. To him the Lorentz solution was artificial, mainly because the so-called contraction was independent of the elastic property inherent in the interferometer itself, as in, for example, the resilience of a tennis ball returning to its original shape after it is struck. He writes of Lorentz's proposal: "Such a conclusion seems so improbable that one is inclined to return to the hypothesis of Fresnel and try to reconcile in some other way the 'negative result' [of the Michelson-Morley experiment]."[801] At other points Lorentz admitted he was uncertain. In 1904 he stated:

> It need hardly be said that the present theory is put forward with all due reserve. Though it seems to me that it can account for all well-established facts, it leads to some consequences that cannot as yet be put to the test of experiment. One of these is that the result of Michelson's experiment must remain negative…[802]
>
> The experiments of which I have spoken are not the only reason for which a new examination of the problems connected with the motion of the Earth is desirable…in order to explain Michelson's negative result, the introduction of a new hypothesis has been required…Surely this course of inventing special hypotheses for each new experimental result is somewhat artificial. It would be more satisfactory if it were possible to show by means of certain fundamental assumptions...[803]

Michelson and the Speed of Light, p. 92). Recognizing the inherent duplicity of Relativity theory, Eddington admitted: "Gulliver regarded the Lilliputians as a race of dwarfs; and the Lilliputians regarded Gulliver as a giant. That is natural. If the Lilliputians had appeared dwarfs to Gulliver, and Gulliver had appeared a dwarf to the Lilliputians – but no! that is too absurd for fiction, and is an idea only to be found in the sober pages of science" (*Space, Time and Gravitation*, pp. 23-24).

[801] A. Michelson, "Relative Motion of the Earth and the Ether," *Amer. Jour. of Science*, vol. III, June 1897, p. 478.

[802] "Electromagnetic Phenomena in a System Moving with any Velocity Less Than that of Light," in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, 1952, p. 29).

[803] As cited in *Thematic Origins of Scientific Thought*, Gerald Holton, 1988, p. 323. Christian Møller adds this criticism: "The contraction hypothesis looks rather startling at first sight, but, as stressed by Lorentz, it is impossible to escape from it as long as the conception of an absolute unmovable ether is maintained…. The difficulty was only that the presupposition that the particles are held together

Notice that Lorentz is concerned with “problems connected with the motion of the Earth,” which tells us that the fear of being forced to accept the “unthinkable” immobile Earth was the basis upon which his *ad hoc* solution was determined. Reading between the lines we know that Lorentz was concerned with the fact that, if he could not come up with a convincing explanation to Michelson-Morley, he and the rest of the world would be in for a great embarrassment. Undaunted, Lorentz put the contraction theory of Fitzgerald into a mathematical equation which eventually became world famous. Known as the “Lorentz Transformation,” it is still employed by scientists today for almost any problem having to do with dismissing the possibility that Earth is motionless in space.[804]

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exclusively by electric forces could scarcely be assumed to be satisfied in the real substances. In particular it was difficult to imagine how the charge of a single electron could be held together, unless strong attractive forces of non-electrical nature were active inside the electron. If one therefore assumes that the contraction formula [$l = l_0(1\text{-}v^2/c^2)^{1/2}$] is valid also for a single electron, as was actually assumed by Lorentz, this must be regarded as a pure hypothesis which cannot be based on the principles of the electron theory alone” (C. Møller, *The Theory of Relativity*, p. 29).

[804] As noted, Fitzgerald was the first to hypothesize length contraction in 1889, but Lorentz improved the concept and applied the mathematics. After Michelson had published the results of his first experiment in the *American Journal of Science* in 1881, Lorentz published its interpretation in 1886 (“Over den invloed, dien de beweging der aarde op de lichtverschijnselen uitoefent,” Koninklijke Akademie van Wetenschappen (Amsterdam); Afdeeling Natuurkunde, Verslagen en Mededeelingen 2 (1885-86): 297-372. Reprinted: “De l’influence du mouvement de la terre sur les phénomènes lumineux,” Archives néerlandaises des sciences exactes et naturelles 21 (1887): 103-176). Of note, Michelson and Morley stated in their 1887 paper that Lorentz’s idea of a partially dragged ether “also fails.” Six years later (1892) Lorentz published his papers on Maxwell’s work (“La theorie electromagnétique de Maxwell et son application aux corps mouvants,” Archives néerlandaises des sciences exactes et naturelles 25 (1892): 363-552; and “De relatieve beweging van de aarde en den ether” reprinted as “The Relative Motion of the Earth and the Ether”). Both the 1886 and 1892 papers postulated the “contraction” concept. In 1895 Lorentz wrote a more definitive paper titled: “Versuch einer Theorie der elektrischen und optischen Erscheinungen in bewegten Koerpern,” in which he elaborated on the ether-based contraction hypothesis. As noted above, Lorentz invented his equation based on Woldemar Voigt’s equation explaining the Doppler-effect for converging spherical forces (Über das Dopplersche Prinzip, Nachr. Ges. Wiss. Göttingen, 1887). Voigt’s equations are based on division by $1 - (v/c)^{½}$ where v is the velocity of convergence. As Wolfgang Pauli describes it: “As long ago as 1887, in a paper still written from the point of view of the elastic-solid theory of light, Voigt

mentioned that it was mathematically convenient to introduce a local time *t*' into a moving reference system…These remarks, however, remained completely unnoticed, and a similar transformation was not again suggested until 1892 and 1895, when H. A. Lorentz published his fundamental papers on the subject" (*Theory of Relativity*, W. Pauli, translated by G. Field, 1958, p. 1). Pauli also notes that "Larmor who, as early as 1900, set up the formulae now generally known as the Lorentz transformation, and who thus considered a change also in the time scale (*ibid*., p. 2, citing J. J. Larmor, *Ether and Matter*, 1900, pp. 167-177). Poincaré made revisions to Lorentz's work, and Lorentz gave a final proposal in 1905, but both agreed that the method of arriving at the formula was by "groping" for it. As Ives reports: "Lorentz arrived at his formulae by a process of invention and accretion; Poincaré arrived at his by giving Lorentz's equations a mathematical going-over to make them fit his principle of relativity" ("Revisions of the Lorentz Transformations," *Proceedings of the American Philosophical Society*, vol. 95, no. 2, April, 1951, p. 131). The formula said that length (L) had to be multiplied by the square root of 1 minus the square of: the velocity of the object divided by the speed of light, $L = L \times 1 - (v/c)^2$. In this formula, v = the speed of the Earth at 30 kilometers per second around the sun, while "*c*" is the speed of light in a vacuum, presently held at 299,792,459 meters per second. The resulting value in the Lorentz transformation is then 0.999999995 = L. In the original equations, $[(1 - v^2/c^2)^{½}]n + 1$ was used for rods shortened when in uniform motion; $[(1 - v^2/c^2)^{½}]n$ was used for rods shortened in the direction of motion, and later, $[(1 - v^2/c^2)^{½}]1 - n$ was used for clocks slowing in uniform motion. Lorentz admitted that the value of "n" was "the origin of all our difficulties," since there was no experimental data to verify its assumed value (See Ives, "Light Signals on Moving Bodies as Measured by Transported Rods and Clocks" *Journal of the Optical Society of America*, July 1937, vol. 27, p. 263). Interestingly enough, the Lorentz-Fitzgerald contraction matched the Fresnel-Fizeau drag coefficient, but this, of course, is only to be expected, since both solutions are merely mathematical gap-fillers for an effect that neither group of scientists understood. Not surprisingly, Max Born cites the notorious controversy leaving open whether the contraction is "real" or only "apparent." A more recent advocate of Lorentz admits:

> Since the first steps of relativity, Lorentz-Fitzgerald contraction has been the subject of a debate which is not closed today, and divides physicists in opposite clans. Some of them consider length contraction as a naive opinion, for example Wesley, Phipps, Cornille, Galeczki. Some others consider it as a fundamental process which explains a lot of experimental facts. Among them Bell, Selleri, Builder, et al. Length contraction had been proposed by Lorentz and Fitzgerald in order to explain the null result of Michelson's experiment. (In fact, the result was not completely null, but much weaker than expected). Length contraction was never observed. Of course, it cannot be observed directly by an observer in a moving frame, since the standard used to

That Lorentz knew the implications of the problem is noted in a personal letter he wrote to Einstein in 1915. As we noted previously (but is well worth repeating), as he began to feel the effects of the centerless universe into which Einstein's Relativity put the human race, in a moment of seeming desperation Lorentz appeals to the same entity upon which Isaac Newton and his "action-at-a-distance" concept found himself depending – a divine being that could hold it all together. Lorentz writes:

> A "world spirit," who would permeate the whole system under consideration without being tied to a particular place or "in whom" the system would consist, and for whom it would be possible to "feel" all events directly would obviously immediately single out one of the frames of reference over all others.[805]

Obviously, Lorentz is finding it difficult to live in the universe he created for himself. Here he is searching for a ubiquitous entity that can not only sense and coordinate all events instantaneously, but one that can also provide him with an absolute frame of reference. Why? Because Lorentz knows deep within himself that it can work no other way. A world of relativity ends up in chaos. Without admitting it, Lorentz is asking for precisely what we are providing – God and a fixed Earth.

For the time being, however, his "transformation" equation would spare him any tinge of guilt. This will not be the first time that mere

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measure it, also contracts. But it could be observed indirectly. This was the objective of different renowned physicists who tried to observe the physical modifications entailed by motion: [*e.g.*,] variation of the refractive index of a refringent solid (Rayleigh and Brace); influence of the ether wind on a charged condenser (Trouton and Noble); the experiments of Trouton and Rankine and of Chase and Tomashek on the electrical resistance of moving objects; and finally of Wood, Tomlison and Essen on the frequency of the longitudinal vibration of a rod. But the experiments proved all negative" ("How the Apparent Speed of Light Invariance Follows from Lorentz Contraction," Joseph Lévy, France, unpublished, pp. 1-2. Lévy has also written: "Hidden Variables in Lorentz Transformation" (P. I. R. T., 1998) and "Some Important Questions Regarding Lorentz-Poincare's Theory and Einstein's Relativity" (P. I. R. T., 1996)).

[805] Henrick Lorentz to Albert Einstein, January 1915, Robert Schulmann, A. J. Kox, Michael Janssen and József Illy, editors, *The Collected Papers of Albert Einstein, Correspondence 1914-1918*, Princeton University Press, 1998, Document 43.

imagination and mathematics come to the rescue to solve scientific enigmas. As Alfred O'Rahilly opined: "The mathematicians got their chance and the semi-educated developed their natural gullibility."[806] In the same vein, Engelbert Schücking boasted: "We have been able to scare most of the ministers out of cosmology by a straightforward application of tensor analysis." As planned, Einstein's obtuse tensors were quite the show-stopper. In November 1919, Ludwik Silberstein approached Arthur Eddington at a joint meeting of the Royal Society and the Royal Astronomical Society. "Professor Eddington," Silberstein declared, "you must be one of three persons in the world who understands general relativity." In response to Eddington's silence, Silberstein continued: "Don't be modest, Eddington." Eddington then replied, "On the contrary, I am trying to think who the third person is!"[807] This reply, of course, was the perfect ploy to form a mystique around Relativity. If one judged Relativity as bogus, then it could be said that he was "not one of three who understood it." If one showed favor to Relativity, he would be deemed as "smart" as the original three. Others, G. Burniston Brown says,

> …were not impressed: they tended to agree with Rutherford. After Wilhelm Wien had tried to impress him with the splendours of relativity, without success, and exclaimed in despair "No Anglo-Saxon can understand relativity!," Rutherford guffawed and replied "No! they've got too much sense!"[808]

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[806] Alfred O'Rahilly, *Electromagnetics: A Discussion of Fundamentals*, 1938; Dover Reprint edition, 1965. p. 851.

[807] Schücking reference to scaring ministers comes from E. L. Schücking, "Cosmology," *Relativity Theory and Astrophysics 1. Relativity and Cosmology*, ed. Jurgen Ehlers, Providence, RI: American Mathematical Society, 1967, p. 218, cited in *The Fingerprint of God*, p. 35. Tensor analysis, originally known as "absolute differential calculus," was invented by Gregorio Ricci Curbastro and Tullio Levi-Civita. It was so abstruse that Alfred North Whitehead said of it: "It is not going too far to say that the announcement that physicists would have in the future to study the theory of tensors created a veritable panic among them when the verification of Einstein's predictions was first announced" (Whitehead, *The Concept of Nature*, p. 182). This would not be the last time a scientific fraud was perpetrated by basing it merely on a mathematical "proof" too difficult for anyone to understand. The conversation between Eddington and Silberstein appeared in *Time*, February 19, 1979, p. 76.

[808] Quoted from the Rutherford Memorial Lecture to the Physical Society 1954 by P.M.S. Blackett (Yearbook of the Physical Society, 1955), as cited in G. Burniston Brown's "What is wrong with relativity"? 1967, p. 71.

Because Relativity was more or less a mathematical theory rather than a physical explanation of nature, the mathematical permutations began to make many scientists skeptical that a true model of the universe had been found. J. J. Thomson, for example, showed what science had morphed into:

> We have Einstein's space, de Sitter's space, expanding universes, contracting universes, vibrating universes, mysterious universes. In fact the pure mathematician may create universes just by writing down an equation, and indeed if he is an individualist he can have a universe of his own.[809]

J. J. Thomson (1856 – 1940)

Thomson's contemporary, Joseph Needham, said of the state of physics at the turn of the century:

> The mathematisation of physics...is continually growing and physics is becoming more and more dependent upon the fate of mathematics....This special mathematics has for the greater part been created by the physicists themselves, for ordinary mathematics is unable to satisfy the requirements of present day physics.[810]

Stanislaw Ulam in *Adventures of a Mathematician*, adds:

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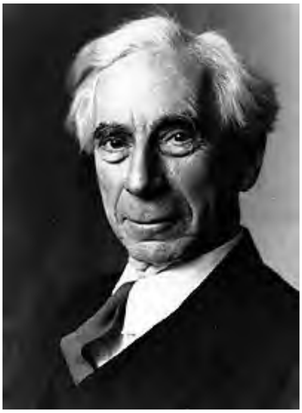
[809] *Einstein: Life and Times*, p. 301.

[810] *Science at the Crossroads*, "Marx's Theory on the Historical Process," 1971, p. 189.

> I should add here for the benefit of the reader who is not a professional physicist that the last thirty years or so have been a period of kaleidoscopically changing explanations of the increasingly strange world of elementary particles and of fields of force. A number of extremely talented theorists vie with each other in learned and clever attempts to explain and order the constant flow of experimental results which, or so it seems to me, almost perversely cast doubts about the just completed theoretical formulations.[811]

Philosopher Bertrand Russell is a bit more sardonic:



Bertrand Russell (1872 – 1970)

> Pure mathematics consists entirely of assertions to the effect that if such and such a proposition is true of *anything* then such and such another proposition is true of that thing. It is essential not to discuss whether the first proposition is really true, and not to mention what the anything is, of which it is supposed to be true. Both of these points would belong to applied mathematics…. Thus mathematics may be defined as the subject in which we never know what we are talking about, nor what we are saying is true.[812]

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[811] Stanislaw Ulam, *Adventures of a Mathematician*, 1976, p. 261.

[812] Bertrand Russell, *Mysticism and Logic*, 1957, pp. 70-71, emphasis in the original. Russell was famous for causing the retraction of G. Frege's two-volume mathematical treatise by pointing out that the then current set theory, formulated by Georg Cantor, led to the absurd conclusion that: "N is a member of N set if, and only if, it is not a member of N set."

Mario Livio, head of the science division of the Hubble Space Telescope, writes:

> The success of pure mathematics turned into applied mathematics, in this picture, merely reflects an overproduction of concepts, from which physics has selected the most adequate for its needs – a true survival of the fittest. After all, "inventionists" would point out, Godfrey H. Hardy was always proud of having "never done anything 'useful.'" This opinion of mathematics is apparently espoused also by Marilyn vos Savant, the "world record holder" in IQ – an incredible 228. She is quoted as having said "I'm beginning to think simply that mathematics can be invented to describe anything, and matter is no exception."[813]

Even more critical of mathematics and its applications to science is Morris Kline, professor of mathematics at the Courant Institute and New York University. He writes:

> The current predicament of mathematics is that there is not one but many mathematics and that for numerous reasons each fails to satisfy the members of the opposing schools. It is now apparent that the concept of a universally accepted, infallible body of reasoning – the majestic mathematics of 1800 and the pride of man – is a grand illusion. Uncertainty and doubt concerning the future of mathematics have replaced the certainties and complacency of the past. The disagreements about the foundations of the "most certain" science are both surprising and, to put it mildly, disconcerting. The present state of mathematics is a mockery of the hitherto deep-rooted and widely reputed truth and logical perfection of mathematics.
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> The disagreements concerning what correct mathematics is and the variety of differing foundations affect seriously not only mathematics proper but most vitally physical science… The loss of truth, the constantly increasing complexity of mathematics and science, and the uncertainty about which approach to mathematics is secure have caused most mathematicians to

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[813] Mario Livio, *The Golden Ratio*, 2002, p. 245. The reference to "inventionists" refers to the debate whether mathematics has been invented or discovered.

> abandon science… The hope of finding objective, infallible laws and standards has faded. The Age of Reason is gone.[814]

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[814] Morris Kline, *Mathematics: The Loss of Certainty*, 1980, p. 6. Quoting Einstein he adds: "The relationship of mathematics to the physical world was well expressed by Einstein in 1921: 'Insofar as the propositions of mathematics give an account of reality they are not certain; and insofar as they are certain they do not describe reality…'. Mathematicians had given up God and so it behooved them to accept man. And this is what they did. They continued to develop mathematics and to search for laws of nature, knowing that what they produced was not the design of God but the work of man" (*ibid*., p. 97). The problems of mathematics are quite numerous, yet most people are still under the illusion that mathematics is the perfect and unassailable science. Problems with infinite sets, the square roots of negative numbers, quaternions, Zeno's Paradox, Euclid's parallel postulate, and many more are well known. Just a couple of examples may suffice: (a) Karl Popper gives the example of:

> "…the square root of 2…consists in showing that the assumption (1) $\surd 2 = n/m$, that is that $\surd 2$ is equal to a ratio of any two natural numbers, n and m, leads to an absurdity. We first note that we can assume that (2) not more than one of the two numbers, n and m, is even. For if both were even, then we could always cancel out the factor 2 so as to obtain two other natural numbers, n' and m' such that n/m = n'/m' and such that at most one of the two numbers, n' and m' would be even. Now by squaring (1) we get (3) $2 = n^2/m^2$, and from this (4) $2m^2 = n^2$, and thus (5) n is even. Thus there must exist a natural number *a* so that (6) $n = 2a$, and we get from (3) and (6) [the next step] (7) $2m^2 = n^2 = 4a^2$, and thus (8) $m^2 = 2a^2$. But this means (9) m is even. It is clear that (5) and (9) contradict (2). Thus the assumption that there are two natural numbers, n and m, whose ratio equals $\surd 2$, leads to an absurd conclusion. Therefore $\surd 2$ is not a ratio, it is 'irrational'" (*Conjectures and Refutations: The Growth of Scientific Knowledge*, p. 86; Mario Livio, *The Golden Ratio: The Story of Phi, The World's Most Astonishing Number*, New York, Random House, 2002, pp. 36-39).

See also: Morris Kline, *Mathematics and the Search for Knowledge*, Oxford University Press, 1986; *Mathematics and the Physical World*, Dover Publications, 1981; Eugene P. Northrop, *Riddles in Mathematics*, Krieger Publishing, 1975; *Mathematics and Western Culture*, Oxford University Press, 1953; Evert Beth, *The Foundations of Mathematics*, New York, Harper and Row, 1966; W. Rudin, *Mathematical Analysis*, New York, McGraw-Hill, 1964; J. M. Dubbey, *Development of Mathematics*, Crane, Russak and Co., 1970; W. S. Hatcher, *Foundation of Mathematics*, W. B. Saunders, 1968; A. Robinson, "The Metaphysics of the Calculus" in *The Philosophy of Mathematics*, ed. J. Hintikka, Oxford University Press; E. Gilson, *The Philosophy of St. Bonaventure*, New Jersey, St. Anthony Guild Press, 1965; Eugene Wigner, "The Unreasonable

Commenting on the *Incompleteness Theorem* of Kurt Gödel, another author offered a sobering assessment of what we can expect in the future:

> …human beings can never formulate a correct and complete description of the set of natural numbers. But if mathematicians cannot even fully understand something as simple as number theory, then it is certainly too much to expect that science will ever expose any ultimate secret of the universe. Any system of knowledge about the world is, and must remain fundamentally incomplete, eternally subject to revision.[815]

Despite the mathematical magic, for now the world would be satisfied that science had sufficiently answered the Earth-shattering dilemma brought to them by Michelson and Morley. Lost in the shuffle, however, was the simplest solution – the one that didn't involve inventing mathematical fudge factors. That solution, of course, was "unthinkable." Science just "knew" the Earth was moving.

Now that science fooled itself into thinking the null result had been solved, there were other issues that needed to be addressed. If everything is in motion and there is no center point in space, then how can we be sure of things we measure? What standard ruler, what immovable object, could be used to measure one thing against another? While Lorentz and Fitzgerald were tackling the mechanics of light beams and moving objects, Henri Poincaré was postulating about the new "relative" universe. In 1896 Poincaré gave a speech at the International Congress of Mathematicians in Zurich describing his own non-Euclidean relativity theory. Einstein was a student there at the time. Poincaré's penchant toward making everything relative is precisely what we would expect once it is postulated that measuring rods contract when they are moving at speeds as slow as 30 km/sec. The whole universe is now outside of the realm of certainty, since no one can ever say for certain what is big or small or fast or slow. In 1904, Poincaré gave another speech on the same subject, this time to the Congress of Arts and Sciences, but a speech that, in his own words, was "an indication of the scientific unrest and philosophical distrust created not

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Effectiveness of Mathematics in the Natural Sciences," *Communications on Pure and Applied Mathematics* XIII (1960); Leonard M. Wapner, *The Pea and the Sun*, A. K. Peters Co., 2005, detailing the 1924 Tarski paradox and the 1014 Hausdorff paradox.

[815] Rudy Rucker, *Infinity and the Mind*, 1982, p. 165.

only by the Michelson-Morley experiment, but by others made during the preceding two decades...”[816]

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[816] *Einstein: The Life and Times*, p. 113. After hearing the news that Walter Kaufmann’s 1905-1906 experiment disproved both Lorentz and Einstein, Lorentz, not being able to add any more modifications to his view, wrote to Poincaré: “Unfortunately my hypothesis of the flattening of electrons is in contradiction with Kaufmann’s results, and I must abandon it. I am, therefore, at the end of my Latin.” Poincaré stated: “The principle of relativity thus does not appear to have the rigorous validity which one was tempted to attribute to it” (*Thematic Origins of Scientific Thought*, Gerald Holton, Harvard University Press, 1988, p. 206). In a 1907 article, Einstein acknowledged that his theory conflicted with Kaufmann’s results, and admitted, at least at that time, he could find no errors in Kaufmann’s experiment or interpretation. But Einstein would not give up, since his theory, based on a macro-evaluation of the whole universe, did not consider micro-results to undermine the basic postulates of his theory. Someway would be found to vindicate Einstein, as has always been the case with physics since 1905. Kaufmann’s experiment involved the deflection of electrons in an electromagnetic field. Kaufmann writes in a Nov. 30, 1905 note: “In addition there is to be mentioned a recent publication of Mr. A. Einstein on the theory of electrodynamics which leads to results which are formally identical with those of Lorentz’s theory. I anticipate right away the general result of the [Kaufmann] measurements to be described in the following: the results are not compatible with the Lorentz-Einstein fundamental assumptions.” The reason is that Kaufmann’s attenuation factor of the electric field strength that deflected the electrons (his “k” value) implied a velocity greater than the speed of light. Max Planck then readjusted Kaufmann’s “k” value to give a slight favoring toward the Lorentz-Einstein theory. In 1908, Bucherer performed a variation of Kaufmann’s experiment using Planck’s recalculated “k” values, which allowed it to agree more with the Lorentz-Einstein model. Planck’s partiality toward Einstein’s Special Relativity theory was no secret, however. As Brush reports: “Planck presented the theory at the physics colloquium in Berlin during the winter semester 1905-6 and published a paper on it in 1906 (the first publication on relativity other than Einstein’s)…As editor of the prestigious journal *Annalen der Physik*, Planck saw to it that any paper on relativity meeting the normal standards would get published. According to Goldberg, Planck was attracted to relativity theory because of ‘his philosophical and ethical convictions about the ultimate laws of reality’” (Stephen Brush, “Why Was Relativity Accepted?” p. 193). In any case, Brush recognizes that Planck’s readjustment of the “k” value only showed that “Kaufmann’s data did not rule out relativity,” not that it vindicated Relativity. Gerald Holton takes a more negative view of Bucherer’s results, stating: “theories of electron motion given earlier by Abraham and by Bucherer do give predictions considerably closer to the experimental results of Kaufmann. But Einstein refuses to let the ‘facts’ decide the matter.” Holton says that “the work of Guye and Lavanchy in 1916” found errors in Kaufmann’s equipment, which was “an

Perhaps Poincaré was referring to the results of Arago and Airy, which up to this time had not been answered by the scientific establishment. A motionless Earth, of course, would have solved all the problems confronting scientists and philosophers, for it would have provided a firm and unmovable standard by which to measure anything in the known universe. The scientific unrest was just beginning, however. The implications of the Lorentz-Fitzgerald contraction would press very deep into the heart of physics and question its very foundations. It was one thing to say that rods shrank as they moved through the ether with the Earth, but to be consistent Lorentz realized that clocks running through the ether must also be affected and thus tick more slowly by the same factor that made the rods shrink. They had no choice but to alter time, for if someone with a normal-running clock is keeping the time of how long it takes the light beam to travel through the ether in Michelson-Morley's experiment, he will record that the beam reached its destination later then it should have, that is, it would have reached its destination much later than the beam traveling perpendicular to the Earth's motion, which would cause significant fringe shifts to appear. So in order to have the clock accommodate an experiment in which no fringe shifts appear, not only must lengths shorten, but the clock calculating how long it took the light beam to travel the shortened distance must run slower than normal. The Relativist is forced to this position. If not, then the light beam will arrive sooner than it should. So now we have what modern science calls "time dilation." The pace of time itself can change, and therefore it is as relative as everything else.

The problems are not over yet. Not only would time be forced to slow down, but Poincaré showed through the laws of momentum that the mass of an object moving against the ether had to increase. Thus, length, time and mass must change to accommodate the null results of Michelson-Morley. Since they were all interconnected they had to stay in balance, otherwise the mathematics would not work. Confounded by all these requirements, Lorentz and Poincaré complained: "nature was conspiring against us." Needless to say nature wasn't conspiring against them; rather, they were conspiring against themselves. Nature was shouting loud and clear that these absurd contortions of length, time and mass could all be avoided if one would simply start from the fact that the Earth was standing still in space. Absolute time, length, and mass would be a natural result of a stationary Earth. But scientists were simply not listening to nature. The stakes were too high for them to hear her sweet, soft voice. This was a

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inadequate vacuum system" discovered by Lorentz (*Thematic Origins of Scientific Thought*, pp. 206, 231, 253).

battle for who was going to control the world and the minds of its people: would it be the Church and the Bible or atheistic science? With Lorentz creating his mathematical fudge factor to explain the Michelson-Morley experiment, and Poincaré developing the first phases of the theory of Relativity, the stage was now set for Albert Einstein to put what science hoped would be the final nail into the coffin of the motionless Earth.

Albert Einstein (1879 – 1955)

Einstein Enters the Fray

How much did the Michelson-Morley experiment influence the thinking of Albert Einstein? Most biographers, historians and academics say that it affected him tremendously, although there are a few who say it was only indirectly.[817] The issue is somewhat difficult because Einstein himself gave different testimonies.

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[817] Among the more notables are, Stephen Hawking in the best-selling *A Brief History of Time*, p. 20, and Richard Feynman in "The Feynman Lectures on Physics," Vol. 1, Reading, Massachusetts: Addison-Wesley, 1963, p. 15, cited in Holton, p. 350. I would estimate that over 95% of the literature holds that Einstein based his theory of Relativity directly upon the Michelson-Morley experiment. Holton sees this as "folklore," and claims that Michelson-Morley had only an "indirect" effect on Einstein's thinking. He cites one or two others in support of his thesis. In the end, Holton's special pleading makes little difference since, as noted above, Einstein made explicit reference to all the "unsuccessful attempts to discover any motion of the Earth," which, after the fact, would include Michelson-Morley. Even Abraham Pais, who is unabashedly favorable to Einstein writes: "Why, on the whole, was Einstein so reticent to acknowledge the influence of the Michelson-Morley experiment on his thinking" (*Subtle is the Lord*, Oxford, 1982, p. 164). The truth is that Einstein was reluctant to base his Relativity theory on Michelson-Morley because it would reveal that his foremost quest was the preservation of Copernicanism and the vindication of Galileo over the Catholic Church.

We have already noted that Einstein was troubled by, as he put it, “the Fizeau experiment on the effect of moving water on the speed of light, and by astronomical aberration, especially Airy’s observations with a water-filled telescope,” but since Michelson-Morley was principally connected to these previous experiments then it should have had an affect on Einstein. Moreover, if it was not precisely the Michelson-Morley experiment that was the primary motivating factor for Einstein in the formulation of his Relativity theory, it was certainly the whole cadre of similar experiments performed after 1887 and prior to 1905, namely, those of Roentgen, Lodge, Rayleigh, Brace, Trouton-Noble and Morley-Miller, all of which produced the same results as Michelson-Morley. Einstein admitted as much in his famous 1905 paper as he makes explicit reference to “the unsuccessful attempts to discover any motion of the Earth relative to the light medium.”[818] We can be sure of one fact: all of the aforementioned experiments from Roentgen to Miller concerned one thing, and only one thing – “motion of the Earth relative to the light medium.”

More specific information that Einstein based Relativity primarily on the Michelson-Morley experiment comes from various sources. **Robert S. Shankland**, who worked with Einstein in the 1950s, reveals some persuasive information. When he visited Einstein in 1950, he asked him how he learned of the Michelson-Morley experiment. In this instance Einstein replied that he had “become aware of it through the writings of H. A. Lorentz, but *only after 1905*.” Two years later (1952), Shankland again asked Einstein the same question, wherein Einstein stated: “This is not so easy. I am not sure when I first heard of the Michelson experiment.” Shankland goes on to comment:

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[818] “Zur Elektrodynamik bewegter Körper,” *Annalen der Physik*, 4th series, 17, Sept. 26, 1905. The full paragraph is: “Examples of this sort, together with the unsuccessful attempts to discover any motion of the Earth relative to the ‘light medium,’ suggests that the phenomena of electrodynamics as well as of mechanics possess no properties corresponding to the idea of absolute rest. They suggest rather that, as has already been shown to the first order of small quantities, the same laws of electrodynamics and optics will be valid for all frames of reference for which the equations of mechanics hold good.”

> However, Einstein said that in the years 1905-1909, he thought a great deal about Michelson's result in his discussions with Lorentz and others in his thinking about general relativity. He then realized (so he told me) that he had also been conscious of Michelson's result *before 1905* partly through his reading of the papers of Lorentz and more because he had assumed this result of Michelson to be true.[819]

This is confirmed by a letter that Einstein wrote to Marcel Grossmann in 1901, in which he stated:

> A new and considerably simpler method for the investigation of the motion of matter with respect to the luminiferous ether has come into my mind. It is based on the usual interference

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[819] *Einstein: The Life and Times*, pp. 128-129. Emphasis added. A longer quote appears in *Thematic Origins of Scientific Thought*, pp. 300-301. Holton admits: "We have positive evidence of Einstein having read only one paper and one book by Lorentz – the paper of 1892 and the book of 1895." Of the 1895 book, Holton attempts to downplay the facts, stating: "…the Michelson ether-drift experiments are only briefly mentioned (on p. 2)…The matter is not brought up again until page 120." Also, Holton admits to "a newly found letter of 1899 (Document 57 of "The Collected Papers of Albert Einstein," vol. 1 [Princeton: Princeton University Press, 1987]) in which Einstein indicated that he had read Wilhelm Wien's paper, "Ueber die Fragen, welche die translatorische Bewegung des Lichtäthers betreffen," *Annalen der Physik und Chemie*, 65:I-xvii, 1898. In it Einstein would have seen a discussion of ten 'experiments with negative result' on the supposed existence of a fixed ether; the Michelson-Morley experiment was the last on Wien's list, with Wien's acknowledgement that it was necessary to adopt a 'hypothesis' of the compensatory shrinking of the length dimensions of rigid bodies to rescue the interpretation of the experiment" (*The Thematic Origins of Scientific Thought*, p. 478). Also G. H. Keswani was able to show that Einstein had, previous to his "Electrodynamik" paper of 1905, read *Science et Hypothèse*, written by Henri Poincaré. The index of Poincaré's book mentions Michelson four times in connection with the Michelson-Morley experiment (G. H. Keswani in "The Origin and Concept of Relativity," *British Journal for the Philosophy of Science* 15: 286-306, 1965. This evidence shows that Einstein not only knew of the Michelson-Morley experiment before his 1905 paper, but also its implications. Thus, statements of Einstein's, such as the one in the letter to a "Mr. Davenport" that Holton cites Einstein writing, which says, "In my own development Michelson's result has not had a considerable influence. I do not even remember if I knew of it at all when I wrote my first paper on the subject (1905)…One can therefore understand why in my personal struggle Michelson's experiment played no role or at least no decisive role," seem to be both a convenient a lapse of memory and an equivocation.

> experiments. If only once inexorable destiny will allow me to finish with the necessary time and calm! When we meet again, I will tell you all about that.[820]

The "usual interference experiments" not only point to the Michelson-Morley experiment but to the many repeats of that experiment performed by various scientists (Lodge, Brace, *et al*) up until 1901. Einstein's knowledge of them is supported by an account that Michelson's biographer, Bernard Jaffe, records from Einstein's speech in honor of Michelson:

> I have come among men who for many years have been true comrades with me in my labors. You, my honored Dr. Michelson, began with this work when I was only a little youngster, hardly three feet high. It was you who led the physicists into new paths, and through your marvelous experimental work paved the way for the development of the Theory of Relativity. You uncovered an insidious defect in the ether theory of light, as it then existed, and stimulated the ideas of H. A. Lorentz and Fitzgerald, out of which the Special Theory of Relativity developed. Without your work this theory would today be scarcely more than an interesting speculation; it was your verifications which first set the theory on a real basis.[821]

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[820] Albert Einstein, "Letter to Grossman, 6?/9/1901," EA, 11-485, cited in Ludwik Kostro, *Einstein and the Ether*, 2000, p. 16.

[821] Bernard Jaffe, *Michelson and the Speed of Light*, 1960, pp. 167-168. Holton points out that there is a sentence in the original German after the clause "out of which the special theory of relativity developed," which is "These in turn led the way to the general theory of relativity, and to the theory of gravitation." From this addition Holton claims that this "switches the discussion away from Michelson and special relativity toward the assembled astronomers and general relativity" (*Thematic Origins of Scientific Thought*, p. 338). But our interest is not so much General Relativity, but what Einstein knew about Michelson's experiment and its implications before he wrote his 1905 paper on Special Relativity. In any case, Holton is forced to admit Einstein's statement on July 17, 1931 to the Physikalische Gesellschaft of Berlin in memory of Michelson (who died two months earlier) that Michelson's greatest idea, as Einstein put it "was the invention of his famous interference apparatus, which came to be of greater significance both for relativity theory as well as for the observation of spectral lines…this negative result [of the Michelson experiment] greatly advanced the belief in the validity of the general relativity theory" (*ibid.*, p. 339). Holton also wrote "On the Origins of the Special Theory of Relativity," in *American Journal of Physics*, Vol. 28 (1960), of which the relevant detail is on pages 627-636. On

There is also the evidence from Yoshimasa Ono who cites an Einstein speech titled: "How I Created the Theory of Relativity," which was delivered at Kyoto University, Japan, on Dec. 14 1922. Einstein delivered the speech in his native German and J. Isiwara (professor of physics at Tohoku University) gave a running translation of the speech to the Japanese students. Isiwara later published his translation in 1923 in the Japanese periodical, *Kaizo*. Ono quotes one part of Isiwara's translation of Einstein's speech as follows:

> Soon I came to the conclusion that our idea about the motion of the Earth with respect to the ether is incorrect, if we admit Michelson's null result as a fact. This was the first path which led me to the special theory of relativity. Since then I have come to believe that the motion of the Earth cannot be detected by any optical experiment, though the Earth is revolving around the sun.[822]

There are also Einstein's lectures at Princeton in 1921, in which Einstein stated:

> But all experiments have shown that electro-magnetic and optical phenomena, relative to the earth as the body of reference, are not influenced by the translational velocity of the earth. The most important of these experiments are those of Michelson and Morley, which I shall assume are known. The validity of the principle of special relativity can therefore hardly be doubted.[823]

Here, once again, we see that Einstein and the rest of modern science got themselves into this conundrum by assuming, as an absolute fact of science and the foundation upon which all other experiments are to be interpreted, that the Earth is revolving around the sun. At the very same time, they admit there is no optical experiment devised that can prove the assumption. What is Einstein's solution? If we can't prove it by an optical experiment, we can still assume the Earth is moving and convince people

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his side is Stephen Brush, who states that Michelson-Morley "was not the primary motivation for his research, and had only a small and indirect effect on his early work" ("Why Was Relativity Accepted?" *Physics in Perspective* 1 (1999), p. 187). This is, indeed, a dubious conclusion when everyone else (Fitzgerald, Lorentz, Poincaré, *et al*) saw Michelson-Morley as quite a dilemma for physics.

[822] Yoshimasa A. Ono, *Physics Today*, 35 (8), 45 (1982).

[823] *The Meaning of Relativity*, four lectures delivered at Princeton University, May 1921, Princeton University Press, 1923, p. 29.

it is so by simply inventing a whole new physics – Special Relativity. As he says himself:

> …to the question whether or not the motion of the Earth in space can be made perceptible in terrestrial experiments. We have already remarked…that all attempts of this nature led to a negative result. Before the theory of relativity was put forward, it was difficult to become reconciled to this negative result.[824]

Hence, with this evidence in the background, it is safe to say that Einstein's theory of Relativity was based and formulated, at least in large part, upon the results of the Michelson-Morley experiment. In fact, it could be said that Einstein was at the mercy of the Michelson-Morley experiment. Even though Albert Michelson and Edward Morley promised in their original 1887 paper that "the experiment would be repeated at intervals of three months, and thus all uncertainty will be avoided,"[825] they never produced another set of readings. The whole world was dependent on only 36 readings taken over six hours in four days, a pittance by scientific standards.[826]

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[824] "Relativity – The Special and General Theory," cited in Stephen Hawking's, *A Stubbornly Persistent Illusion*, 2007, p. 169.

[825] "On the Relative Motion of the Earth and the Luminiferous Ether," *American Journal of Science*, Third Series, Vol. xxxiv (203), Nov. 1887.

[826] Michelson and Morley took 17 readings twice each day (noon and evening) on July 8 and 9, and one reading each on July 11 and 12:

- Trial 1: July 8 (noon): -0.001; +0.024; +0.053; +0.015; -0.036; -0.007; +0.024; +0.026; -0.021; -0.022; -0.031; -0.005; -0.024; -0.017; -0.002; +0.022; -0.001.
- Trial 2: July 8 (evening): -0.016; +0.008; -0.010; +0.070; +0.041; +0.055; +0.057; +0.029; -0.005; +0.023; +0.005; -0.030; -0.034; -0.052; -0.084; -0.062; -0.016.
- Trial 3: July 9 (noon): +0.018; -0.004; -0.004; -0.003; -0.031; -0.020; -0.025; -0.021; -0.049; -0.032; +0.001; +0.012; +0.041; +0.042; +0.070; -0.005; +0.018.
- Trial 4: July 9 (evening): +0.007; -0.015; +0.006; +0.004; +0.027; +0.015; -0.022; -0.036; -0.033; +0.001; -0.008; -0.014; -0.007; +0.015; +0.026; +0.024; +0.007.
- Trial 5: July 11 (noon): +0.015; -0.035; -0.039; -0.067; -0.043; -0.015; -0.001; +0.027; +0.001; -0.011; -0.005; +0.011; +0.047; +0.053; +0.037; +0.005; +0.015.

In the meantime, **Wilhelm C. Roentgen**, famous for the discovery of X-rays, performed an experiment in 1888 (which was the forerunner of the Trouton-Noble experiment of 1903) and reported his "unsuccessful" attempt in detecting the "velocity of the Earth through the ether."[827] Sir Oliver Lodge, who received fame for his work in electricity, performed "ether wave" experiments in 1892, which were designed to detect the Earth's motion through space. He sent light beams between rapidly moving steel disks to test the hypothesis that, as matter moved, it would drag ether with it. He observed no such effect.[828] If there was no ether drag, an obvious conclusion would be that the Earth was not moving through the ether, and thus standing still in space, but neither Lodge nor his colleagues were of the frame of mind to consider such an option.[829] Still, Lodge showed, contrary to Michelson's 1887

- x Trial 6: July 12 (evening): +0.034; +0.042; +0.045; +0.025; -0.004; -0.014; +0.005; -0.013; -0.030; -0.066; -0.093; -0.059; -0.040; +0.038; +0.057; +0.041; +0.034;

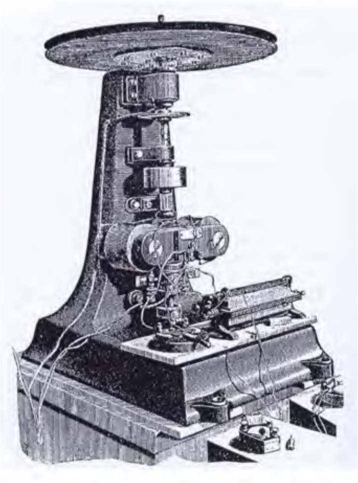
[827] W. C. Roentgen (or Röntgen), *Annalen der Physik* 35:264, 1888. After Roentgen, A. Eichenwalt, *Annalen der Physik* 11:1, 241, 1903, and H. A. Wilson, *Philosophical Transcripts of the Royal Society*, London 204:121, 1904, used the "Roentgen convection" with electric and magnetic fields, respectively, but with no significant results.

[828] *Philosophical Transcripts of the Royal Society*, London 184: 727-804, 1893; 189:149-166, 1897. In his book *The Ether of Space* he writes: "At first I saw plenty of shift…On stopping the disks the bands returned to their old position. On starting them again in the opposite direction the bands ought to have shifted the other way too, if the effect were genuine; but they did not; they went the same way as before. The shift was therefore wholly spurious….We have no means of getting hold of the ether mechanically; we cannot grip it or move it in the ordinary way: we can only get it electrically. We are straining the ether when we charge a body with electricity; it tries to recover, it has the power of recoil." In another work he writes: "…space empty of matter is endowed with finite and measurable physical properties. It is absolutely transparent and undispersive. In other words it quenches no light but transmits it undiminished in total intensity, though diluted by spreading…" (Oliver Lodge, *The Ether of Space*, 1909. p. 70).

[829] In Lodge's book, *The Ether of Space*, he consistently refers to "Earth's moving through space at nineteen miles a second" as the basis for all his interpretations of the interferometer experiments (pp. 48, 55, 58, 61, 63, 66, 68), never once allowing for an immobile Earth to answer the perplexing questions.

experiment, that light was not affected by the motion of adjacent matter. This led Michelson to plan a repeat of his 1887 experiment in 1897, since he proposed to himself that perhaps in his first attempt in the basement laboratory in Cleveland the ether was "trapped" and therefore became motionless. But in 1897 Michelson found that there was no difference when the interferometer was placed above the ground. The displacement was less than one-twentieth of a fringe.[830] As Robert Laughlin sees it, instead of opting for a non-moving Earth, science chose to make the speed of light invariable and allow objects to magically gain mass:

> By 1897 this had improved to a factor of forty, a disparity too great to be dismissed as irrelevant or an experimental artifact. The expected modification of the speed of light due to the earth's motion did not exist. This finding led Albert Einstein to conclude that the speed of light is fundamental and that moving bodies must gain mass as their speed increases.[831]



The Lodge Ether Machine

In 1902, Lord Rayleigh performed another ether-drift experiment, this one depending on a refractometer that would produce a double refraction of light. His concept was to discharge polarized light in a direction parallel to the motion of ether-drift (or the motion of the Earth) over against polarized light perpendicular to that direction, thus causing a different velocity in the two beams, which would be detected by a double refraction. Rayleigh was unable to detect any effect, although some claim that his equipment may not have been sensitive enough to give a positive result.[832]

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[830] Dorothy Michelson Livingston, *The Master of Light: A Biography of Albert A. Michelson*, p. 200.
[831] Robert B. Laughlin, *A Different Universe*, p. 13.

To rectify this apparent problem, in 1904 **DeWitt Bristol Brace** built an apparatus that had 150 times more sensitivity than Rayleigh's. Brace reflected the light back and forth several times and thus was able to increase the light path to 30 meters. In order to detect the rotation of the direction of polarization, he invented a very sensitive polarimeter for the occasion. With this equipment he could detect a difference of up to 7.8×10^{-13} between the two velocities, which was 300 times greater than the Michelson-Morley experiment.[833] Brace reported that he did not find any ether drift. Lorentz, assuming again that the Earth was in motion, described their efforts as follows:

> Rayleigh and Brace have examined the question whether the Earth's motion may cause a body to become doubly refracting. At first sight this might be expected, if the just mentioned chance of dimensions is admitted. Both physicists, however, have obtained a negative result.[834]

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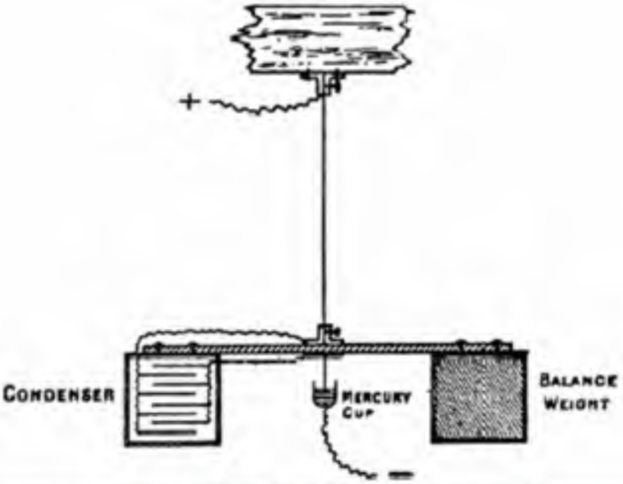
[832] *Philosophical Magazine*, 4, 678, 1902 and 1904. Also, "On the Theory of Optical Images," *Philosophical Magazine*, 42:167, 1896.

[833] "Double Refraction in Matter Moving Through the Ether." *Philosophical Magazine*, new series, 7: 317-328, 1904. Interestingly enough, Brace also tested the Lorentz-Fitzgerald contraction hypothesis, using optical methods, and found it unsupported by his results.

[834] "Electromagnetic Phenomena in a System Moving with any Velocity Less Than that of Light," H. A. Lorentz, in *The Principle of Relativity*, 1952, p. 11.



Trouton-Noble Experiment

Just a year prior (1903) F. T. Trouton and H. R. Noble did another experiment to detect ether drift. Their results seemed to confirm the thesis that there was no significant drift, although the interpretation of that experiment is still in dispute.[835] Using even more sophisticated interferometers, most scientists found "null" results similar to those of Michelson-Morley. Experiments by Trouton and Rankine[836] and of Chase and Tomashek[837] on the electrical resistance of moving objects, and also of Wood, Tomlinson and Essen[838] on the frequency of the longitudinal vibration of a rod likewise proved "negative." In 1903-1905 Edward Morley and Dayton Miller tested for ether drag in a series of interferometer experiments and found the same results as Morley's 1887 experiment, at least no results above 8 km/second for the respective speed of ether against Earth.[839] As we will see later, when Miller worked by himself in 1925, he again found an ether drift of 8-10 km/sec.

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[835] At the suggestion of Fitzgerald, Trouton and Noble suspended a highly-charged parallel-plate capacitor. If the Earth is moving around the sun through the ether, an electromagnetic torque is to be expected due to magnetic forces, since the capacitor is moving through the ether. The plate will minimize its total energy and seek a stable position parallel to the direction of the motion of the Earth (*e.g.*, a zero-point field). Trouton and Noble reported a null result, that is, the plate did not orient itself in a position which eliminates the angular momentum against the velocity of the Earth (F. T. Trouton and H. R. Noble, "The forces acting on a charged condenser moving through space," *Proceedings of the Royal Society*, Vol. 72, p. 132, 1903; *Phil. Trans. Royal Soc.* A 202, 165–181, 1903. In 1927, Carl T. Chase confirmed Trouton-Noble's results (C. T. Chase, "A repetition of the Trouton-Noble ether drift experiment," *Physical Review*, Vol. 28, p. 378, 1926; 30, 516-519, 1927). As recently as 1994, H. C. Hayden reconfirmed the null result with an apparatus 105 times more sensitive than Trouton-Noble's (H. C. Hayden, "High sensitivity Trouton-Noble experiment," *Review Scientific Instruments*, Vol. 65, No. 4, p. 788, 1994), but Hayden stated that one could not argue for the existence of ether (H. C. Hayden, "Analysis of Trouton-Noble experiment, Galilean Electrodynamics," Vol. 5, No. 4, p. 83, 1994). His claim has been contested in 1998 by Patrick Cornille and Jean-Louis Naudin (P. Cornille,

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"Correspondence: Making a Trouton-Noble experiment succeed," *Galilean Electrodynamics* 9 (2), 33, 1998. P. Cornille, "A linear Trouton-Noble experiment which shows the violation of Newton's third law," *Hadronic J. Supplement* 13 (2), 191–202, 1998, and in 2000 by Alexandre D. Szames, Patrick Cornille, Jean-Louis Naudin and Christian Bizouard). The latter's abstract states: "When correctly performed, this very simple electrostatic ether drift experiment gives unambiguous positive results: a suspended, parallel-plate capacitor charged at high voltage by means of lateral feeding wires exhibits a stimulated torque and tends to line up its plates in the East-West direction" (AIP Conference Proceedings Vol. 504 (1) pp. 1004-1017, January 19, 2000). See also Saul A. Teukolsky, "The explanation of the Trouton-Noble experiment revisited," *American Journal of Physics* 64 (9), 1104–1109, 1996; Oleg D. Jefimenko, "The Trouton-Noble paradox," *Journal of Physics* A. 32, 3755–3762, 1999; L. Nieves, M. Rodriguez, G. Spavieri, and E. Tonni, "An experiment of the Trouton-Noble type as a test of the differential form of Faraday's law," *Il Nuovo Cimento* 116 B (5), 585–592 (2001). Michel Janssen, "A comparison between Lorentz's ether theory and special relativity in the light of the experiments of Trouton and Noble," Ph.D. thesis, 1995.

[836] F. T. Trouton and A. D. Rankine, "On the Electrical Resistance of Moving Matter," *Proceedings of the Royal Society* 80, 420, 1908.

[837] C. T. Chase, *Physical Review*, 30, 516 (1927); R. Tomashek, *Annalen der Physik*, 73, 105, 1924; 78, 743, 1925; 80, 509, 1926; 84, 161, 1927.

[838] A. B. Wood, G. A. Tomlinson, L. Essen, "The Effect of the Fitzgerald-Lorentz Contraction on the Frequency of Longitudinal Vibration of a Rod," *Proceedings of the Royal Society*, 158, 6061, 1937.

[839] Morley and Miller had extended the paths of the light beams considerably in contrast to the 1887 experiment, and also replaced the foundation of their apparatus with stone, wood and steel, respectively. In the third trial of 1905, they moved the apparatus to a hill in Cleveland Heights, Ohio, which was 285 meters high, but this did not change the results, which was an ether wind of about 3.5 kilometers per second. Morley and Miller also tested for Fitzgerald's contraction hypothesis and found their results did not support it. Because of other pressing issues, Miller would not return to these experiments until 1921.

Dayton Miller (1866 – 1941)

With all these “negative” experimental results, in addition to those of Michelson-Morley in 1881 and 1887, the evidence was mounting like flood water at the dam. If someone did not find an answer soon, the dam was going to break. On the macro-level, there were only two possible answers: (a) the Earth was motionless in space, or (b) the Earth was carrying the ether with it as it revolved around the sun. But since having the Earth carry the ether led to difficulties with the observed aberration of starlight (as we saw with the Arago, Airy and Fresnel affair), this left only a motionless Earth to solve the problem. Of course, that solution was “unthinkable” to modern man.

Because the attempts of Lorentz and Poincaré at answering Michelson-Morley, Lodge, Brace, Rayleigh and Trouton-Noble were unsatisfactory to Einstein, he set out to create his own theory, and one that would put a significant demarcation between all past science and future science. As noted earlier, Einstein was well aware of the implications of these experiments, since he makes explicit mention in his 1905 paper of “the unsuccessful attempts to discover any motion of the Earth.” This certainly coincides with Einstein’s statement in 1921 that his theory of Relativity “is not speculative in origin; it owes its invention entirely to the desire to make physical theory fit observed fact as well as possible."[840] In fact, so pressured was Einstein to explain these experiments that, in his effort to save Copernicus, he would end up destroying the idea of a heliocentric system in exchange for an a-centric system, as well as obliterating Isaac Newton's concept of "absolute space." Up until Einstein, men had believed in some type of absolute space and absolute time. They didn't know the precise constitution of space, but intuitively they reasoned that something real and substantive had to occupy the space between Earth and the stars. As Oliver Lodge had described it: "space empty of matter is endowed with finite and measurable physical properties. It is absolutely transparent and undispersive….a perfect continuum, an absolute plenum."[841] This 'substance' would serve as the background against which to make all cosmic measurements, even if only theoretical.[842] Because Galileo and Newton rejected a centrally located and motionless Earth, they were in desperate need of a motionless medium outside of Earth to serve as the standard upon which all other objects of the universe moved and could be measured.

Although Newton did not believe that absolute motion could be detected by mechanical means (since all objects were in motion), this left room for absolute motion to be detected by non-mechanical devices, namely light. But because Hoek's, Airy's, and Michelson-Morley's experiments with light did not detect absolute motion through a medium (the medium commonly known as "ether"), then Einstein understood that he had two choices: either Earth was not in motion, or the ether did not exist and absolute motion could never be detected, even when using light. The difference between Newtonian Relativity and Einsteinian Relativity is that the former says absolute motion cannot be detected by mechanical means, while the latter says it cannot be detected either by mechanical or non-mechanical means.

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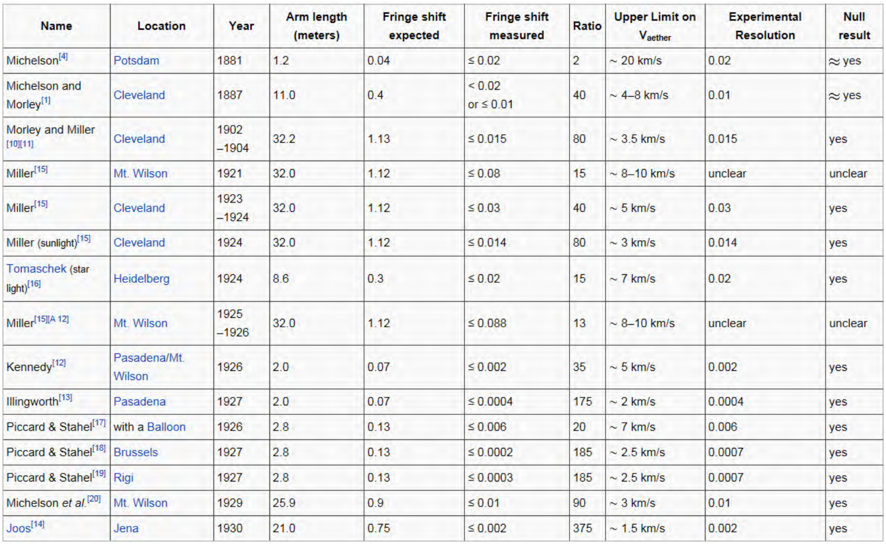
[840] *Einstein: The Life and Times*, p. 128.

[841] *The Ether of Space*, 1909, p. 95.

[842] We emphasize "theoretical" to accommodate the fact that since Newton's heliocentrism did not leave him with any heavenly body at rest, he thus depended on his own "relativity" to understand motion. As Newton put it in his *Principia*: "It may be that there is no body really at rest, to which the places and motions of others may be referred." As a result, Newton's relativity then leads to his three laws of motion. As Rom Harré describes it: "We must notice a peculiarity of his [Newton's] famous laws. They have an important mathematical property, called Galilean Invariance. This property means that Newton's Laws of Motion are the same for all bodies, no matter how fast they are moving relative to each other….It follows that there is no mechanical way of detecting one's absolute motion" (*Great Scientific Experiments*, 1981, p. 126).



Name	Location	Year	Arm length (meters)	Fringe shift expected	Fringe shift measured	Ratio	Upper Limit on V_{aether}	Experimental Resolution	Null result
Michelson[4]	Potsdam	1881	1.2	0.04	≤ 0.02	2	~ 20 km/s	0.02	≈ yes
Michelson and Morley[1]	Cleveland	1887	11.0	0.4	< 0.02 or ≤ 0.01	40	~ 4–8 km/s	0.01	≈ yes
Morley and Miller [10][11]	Cleveland	1902 –1904	32.2	1.13	≤ 0.015	80	~ 3.5 km/s	0.015	yes
Miller[15]	Mt. Wilson	1921	32.0	1.12	≤ 0.08	15	~ 8–10 km/s	unclear	unclear
Miller[15]	Cleveland	1923 –1924	32.0	1.12	≤ 0.03	40	~ 5 km/s	0.03	yes
Miller (sunlight)[15]	Cleveland	1924	32.0	1.12	≤ 0.014	80	~ 3 km/s	0.014	yes
Tomaschek (star light)[16]	Heidelberg	1924	8.6	0.3	≤ 0.02	15	~ 7 km/s	0.02	yes
Miller[15][A 12]	Mt. Wilson	1925 –1926	32.0	1.12	≤ 0.088	13	~ 8–10 km/s	unclear	unclear
Kennedy[12]	Pasadena/Mt. Wilson	1926	2.0	0.07	≤ 0.002	35	~ 5 km/s	0.002	yes
Illingworth[13]	Pasadena	1927	2.0	0.07	≤ 0.0004	175	~ 2 km/s	0.0004	yes
Piccard & Stahel[17]	with a Balloon	1926	2.8	0.13	≤ 0.006	20	~ 7 km/s	0.006	yes
Piccard & Stahel[18]	Brussels	1927	2.8	0.13	≤ 0.0002	185	~ 2.5 km/s	0.0007	yes
Piccard & Stahel[19]	Rigi	1927	2.8	0.13	≤ 0.0003	185	~ 2.5 km/s	0.0007	yes
Michelson *et al.*[20]	Mt. Wilson	1929	25.9	0.9	≤ 0.01	90	~ 3 km/s	0.01	yes
Joos[14]	Jena	1930	21.0	0.75	≤ 0.002	375	~ 1.5 km/s	0.002	yes

The above chart is taken from Wikipedia.[843] In each case it can be seen that, similar to Michelson-Morley, the "Fring shift measured" is a fraction of the "Fringe shift expected." Yet for some odd reason, each experiment (except for two unexplained instances of Miller's) says "yes" to the column of "Null result." Hence, all the contributors to Wikipedia for this topic assume the Earth is revolving around the sun as the foundational basis for interpreting whether the results are "null."

Ether Entrainment: The Third Option to Interpret Michelson/Morley

As noted above, a third choice not favorable to Einstein, and the one that would favor Newtonian Relativity, was that the ether moved with the Earth and at the same speed, commonly known as "ether entrainment." Various modern ether theories opt for this choice since they reject Relativity theory but still believe a moving Earth is a sacrosanct fact of science. Modern thinkers who espouse this view are few, but one of the more prominent is Tom Bethell, who bases his view on those of Petr Beckmann. His view is that "The Earth's field 'translates' with the Earth, but it does not rotate with its rotation."[844] The major problem with the ether entrainment theory, however, is that it would only be viable if the Michelson/Morley experiment showed no positive result. If the ether were entrained by a moving Earth then the Michelson/Morley apparatus would show no fringe shifting. But since the results were positive to at least one-sixth of what they expected, then the ether had to be moving against the Earth to that degree and thus could not be entrained. The only other possibility is that the ether was only partially entrained around the Earth as the latter moved around the sun. This would require the Earth to have only a small fraction of the power needed to hold ether close to its surface, but the full power to hold all of the atmosphere close to its surface as it whipped around the sun at 66,000mph. Moreover, a fractional ether entrainment would require a mechanism to demarcate the entrained ether from the non-entrained ether, or at least gradient levels of entrained ether, but these are distinctions which have no experimental evidence to support them. As Martin Selbrede notes:

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[843] http://en.wikipedia.org/wiki/Michelson%E2%80%93Morley_experiment

[844] *Questioning Einstein: Is Relativity Necessary?*, 2009, p. 181. See also pp. 91, 103. Bethell adds: "But Lorentz went astray, surely, when he suggested that, if we can detect a small rotational effect, we can't 'a priori deny the possibility' of

> The problem with these ether entrainment models is a serious one. It is that we appear to have ether entrainment for the velocity around the sun, which is a very fast velocity, and no apparent ether entrainment for the rotational velocity at the equator of a thousand miles per hour. So why is it that the faster speed has no entrainment and this lower speed does? Entrainment models can't explain that.[845]

What we know is that the ether is there and it is consistent. As **Herbert Ives** acknowledged:

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seeing the larger effect of the Earth's translation (orbital motion). Attempts had already been made by Michelson and Co. to detect the large translation effect, without success. Decades later, the smaller rotational effect indeed was detected, thanks to much more refined clocks. But even with more and more accurate instruments investigators still have not been able to detect – and it is safe to say they never will detect – the translational effect. For it isn't there to be seen" (p. 181). A letter was sent by this author in 2009 to Mr. Bethell on this point, suggesting to him that no "detection of a translation effect" was forthcoming simply because the Earth is not orbiting the sun, but he declined to answer the challenge. It is precisely for Bethell's unproven presumption that causes him to conclude that all the interferometer experiments by Miller, Piccard, Townes, *et al*, "found no fringe shift" (p. 194). Bethell even says that Michelson-Morley found no fringe shift (p. 185), but this is obviously a misrepresentation of these experiments since they all reported at least some fringe shifting.

[845] Interview of Martin Selbrede for the scientific documentary, *The Principle*, produced by Stellar Motion Pictures, LLC, Los Angeles, California, 2012.

> The frequent assertion that 'the Michelson-Morley experiment abolished the ether' is a piece of faulty logic. When Maxwell predicted a positive result from the experiment he did so on the basis of *two* assumptions; the first, that the light waves were transmitted through a medium, the second, which was not realized until pointed out by Fitzgerald, that the measuring instruments would not be affected by motion. The null result of the experiment proved *some* assumption made in predicting a positive result to be wrong. The experimental demonstration of the variation of measuring instruments with motion, in exactly the way to produce a null result, shows that it was the second assumption alone that was wrong; leaving evidence for a transmitting medium, as derived from aberrational and rotational phenomena [*cf.*, Arago, Airy, *et al.*], as strong, if not stronger, than ever.[846]

Einstein and the Incredible Shrinking Machine, Phase II

Einstein opted to eliminate the ether and resign the world to having no absolutes. As he developed his theory to support that choice, he was hailed as the greatest scientist the world has ever known. Modern humanity was on the brink of utter humiliation before the Greeks, Romans, Egyptians and Babylonians, but Einstein, at least so the world thought, saved them from having to bow the knee. As we will see, Einstein created two theories to replace Newton. The Special Relativity theory held that there is no absolute time or absolute space; while the General Relativity theory held that space moved (or "curved"), and this movement is the principle cause of gravity, among other things. In regards to motion (as opposed to time and space) the word "Special" in Special Relativity referred to the "special" cases of uniform (non-accelerated) motion, and the word "General" in General Relativity referred to cases of non-uniform (accelerated or decelerated) motion.

After Poincaré's initial work, Einstein further developed the mathematics behind the theory of Relativity. He realized that in order to maintain the mathematical validity of his theory (that is, that the light beams of the interferometer were equal in speed), contractions of time and length could not be ignored. But whereas Lorentz had invented the length contractions to compensate for the ether's effect on the light beam, Einstein dispensed with the ether altogether, and thus he was left with having to explain the length and time contraction by another means.[847] As G. Burniston Brown notes:

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[846] "The Measurement of the Velocity of Light by Signals Sent in One Direction," *Journal of the Optical Society of America*, Oct. 1948, vol. 38, no. 10, p. 879.

> Einstein's attempt to derive the Lorentz transformation equations from the principle of relativity and the postulate that the velocity of light is independent of that of the source would (if it had not involved a contradiction) have made Lorentz transformations

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[847] Interestingly enough, in Einstein's theory one might say there is no real length contraction (only apparent contraction) because, without ether, there is no measurable motion between the apparatus and the observer. Ives, quoting Lorentz about his own contraction formula, states: "[it] enables us to predict that no experiment made with a terrestrial source of light will ever show us the influence of the Earth's motion." Here Lorentz admits that, the very basis for his experiment (*i.e.*, a moving Earth), cannot be proven by experiment. As for Einstein's mathematics, Ives goes on to say: "Einstein, starting with this conclusion [that no experiment will show the influence of the Earth's motion]…and elevating it to a new principle of physics, was able, by working backward, to deduce the contraction formula $(1 - v^2/c^2)^{1/2}$" ("Historical Note on the Rate of a Moving Clock," *Journal of the Optical Society of America*, Oct. 1947, vol. 37, no. 10, p. 810). Assis adds this interesting note: "Einstein…stated that 'the introduction of the luminiferous ether will prove to be superfluous.' If this is the case, then he should have discarded length contraction of rods and rigid bodies. After all, this idea of length contraction was only introduced to reconcile the null result of the Michelson-Morley experiment with the ether concept. If there is no ether, we should not expect any change in the interference fringes…But in this case it makes no sense to introduce or to suppose a length contraction of bodies. Making the ether superfluous would require making length contraction superfluous as well. This was clearly pointed out by O'Rahilly in his book, *Electromagnetic Theory – A Critical Examination of Fundamentals*, Vol. 1, Chap. VIII, Sect. 1, p. 259 [108]. As we know, this logical course was not followed by Einstein. He retained the length contraction although he had discarded the ether! With this, another source of confusions and paradoxes was brought into physics" (*Relational Mechanics*, pp. 145-146). It is also interesting to note, as G. Burniston Brown does, "There were other disturbing features: the fact that Einstein never wrote a definitive account of his theory; that his first derivation of the Lorentz transformation equations contained velocities of light of $c - v$, $c + v$ and $(c^2 - v^2)^{1/2}$, quite contrary to his second postulate that the velocity of light was independent of the motion of the source; and that his first attempt to prove the formula $E = m_0c^2$, suggested by Poincaré, was fallacious because he assumed what he wanted to prove, as was shown by Ives (Ives 1952)" ("What is wrong with relativity?" Vol. 18, March, 1967, p. 71)

independent of any particular assumption about the construction of matter (as it had not been in Lorentz's derivation). This feature, of course, was pleasing to the mathematically minded, and Pauli considered it an advance. Einstein said that the Lorentz transformations were “the real basis of the special relativity theory” (Einstein 1935), and this makes it clear that he had converted a theory which, in Lorentz’s hands at any rate, was a physical theory (involving, for instance, contraction of matter when moving with respect to the aether) into something that is not a physical theory in the ordinary sense, but the physical interpretation of a set of algebraic transformations derived from a principle which turns out to be a rule about laws, together with a postulate which is, or could be, just the algebraic expression of a fact—the independence of the velocity of light of that of the source (experiments already done appear to confirm it but more direct evidence is needed). We see, then, that ‘relativity’ is not an ordinary physical theory: it is what Synge calls a “cuckoo process”; that is to say. Nature’s laws must be found first, and then they can, perhaps, be adapted to comply with the overall ‘principle.’

“The eggs are laid, not on the bare ground to be hatched in the clear light of Greek logic, but in the nest of another bird, where they are warmed by the body of a foster mother, which, in the case of relativity, is Newton’s physics of the 19th century” (Synge 1956).

The special theory of relativity is therefore founded on two postulates

(a) a law about laws (Poincaré’s principle of relativity).

(b) an algebraic representation of what is, or could be, a fact (velocity of light constant, independent of the velocity of the source) and its application to the physical universe is

(c) a cuckoo process.

This basis of the theory explains a great deal that has mystified many physicists and engineers. They could not understand how Einstein could sometimes speak as though the aether was superfluous (Einstein 1905) and at other times say “space

> without aether is unthinkable" (Einstein 1922). This was due, of course, to not starting with physical terms—matter its motion, and its interactions (force). A physical theory which included radiation would have to start by stating whether an aether, action-at-a-distance, or ballistic transmission of force was being postulated….
>
> The fact that Einstein asserted that the Lorentz transformation equations were the basis of the special theory, and these are, of course, purely mathematical, means that, in so far as the theory is considered to have any physical implications, these implications must be the result of the interpretation of mathematical expressions in physical terms. But in this process there can be no guarantee that contradictions will not arise, and, in fact, serious contradictions have have arisen which have marred the special theory. Half a century of argumentation has not removed them, and the device of calling them only apparent contradictions (paradoxes) has not succeeded in preventing the special theory of relativity from becoming untenable as a physical theory.[848]

For Einstein and his generation the syllogism was simple:

Major Premise: We can't detect the Earth moving.
Minor Premise: We know the Earth moves.
The Conclusion: We must accept Relativity.[849]

The alternative syllogism that was "unthinkable" for Einstein and his colleagues was:

Major Premise: We can't detect Earth moving.
Minor Premise: The Earth isn't moving.
The Conclusion: We must accept Absolutes.

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[848] "What is wrong with relativity?" G. Burniston Brown, *Bulletin of the Institute of Physics and Physical Society*, Vol. 18, March 1967, pp. 73-74.

[849] Galileo came to the same conclusion and developed what we know today as Galilean Relativity. Like Einstein, Galileo presumed the Earth was moving around the sun but we had no way of sensing or detecting the movement, which then led to the idea that the motion of a uniformly moving object (*i.e.*, one that induces no inertial forces such as centrifugal or Coriolis forces) is relative. Galileo used the example of a man in a ship who is moving uniformly across the ocean and not being able to tell whether he was moving or the water is moving past him (if he had no landmarks against which to judge his motion).

As Martin Selbrede notes:

> We say that the result is truthful and you should believe the detector, and they say, 'No, we have to explain away the result of the detector because we know that the Earth is in motion regardless of the speedometer telling us it is at zero. So if Einstein's explanation of the non- zero result is put aside, then we have only one alternative left, which is that the measurement is correct and the Earth isn't in motion at all. So when people say, 'Well, the geocentrists are not scientific because they don't follow the experiments,' no, we are the ones who actually point to the experiments and say, 'hello, wake up, zero mile per hour motion according to this instrument.' And that's where modern science has fallen apart ever since. Ever since that happened, modern science has been in a conundrum, and it actually has split into two giant sides: the Relativity side for the large and the Quantum side for the small, and we haven't been able to unify all things back together again. At least under the geocentric paradigm we see the potential for a unification.[850]

Because Einstein believed Earth's motion through space was an accepted fact, he eliminated the ether because, as he understood it, no experiment had demonstrated its existence. Like his predecessors, Einstein just "knew" the Earth moved, so it was virtually inevitable that he, or someone else, would conclude that ether did not exist. We know, of course, that the evidence demonstrated only that Earth was not moving at 30+ km/sec, not that ether was non-existent. Eliminating the ether certainly solved a lot of problems for Einstein, but like any *ad hoc* solution, it created additional ones.[851] William Magie, president of the

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[850] Interview of Martin Selbrede for the scientific documentary, *The Principle*, produced by Stellar Motion Pictures, LLC, Los Angeles, California, 2012.

[851] The differences between the Lorentz's theory and Einstein's theory, as Herbert Dingle points out,

> Lorentz ascribes the contraction of rods and slowing down of clocks to an *ad hoc* physical effect of the ether on moving bodies; Einstein ascribes them to an *ad hoc* modification of kinematics at high velocities. Lorentz's theory is impossible without an ether; Einstein's (because of its relativity postulate) is impossible with one. Einstein's theory makes a velocity greater than *c* logically impossible; Lorentz specifically restricted his theory to 'a system moving with any velocity less than that of light,' and, from the nature of its effects, it must break

American Physical Society, pointed out one of the obvious ones in 1911. To his scientific constituents he complained:

> The principle of relativity accounts for the negative result of the experiment of Michelson and Morley but without an ether how do we account for the interference phenomena, which made that experiment possible?[852]

In order to answer Michelson-Morley without using ether as the cause for length and time contraction, Einstein resorted to saying that mere motion causes them to contract. There was something about motion itself that produced all kinds of instability in a world we had normally thought was stable. For Einstein, ether was now "superfluous" because space itself, whatever he imagined it to be, performed the same task. He writes:

> The introduction of a 'light ether' will prove to be superfluous, because the view here to be developed will introduce neither a 'space at absolute rest' provided with special properties, nor assign a velocity vector to a point of empty space in which electro-magnetic processes take place.[853]

His biographer, Ronald Clark, gives more detail:

> down well short of that velocity…it makes the 'light barrier' no more necessarily impassable than the 'sound barrier.' Einstein's theory merges space and time into an unimaginable 'space-time'; Lorentz leaves them independent, as in ordinary understanding. The physical consequences of these differences when very high macroscopic velocities are attained are enormous and ominously incalculable" (*Science at the Crossroads*, p. 232).

Still, since Einstein's theory was based on alterations of the basic fabrics of life, it could be said, as J. L. Synge observed in 1956, that the Special Theory of Relativity might be called the theory of the Lorentz transformations. Similarly, Bertrand Russell stated that the "whole of the special theory is contained in the transformations." Essen adds: "Einstein's theory differs from that of Lorentz only in the method of derivation of the transformations…the subsequent mathematical development could be the same in both theories" (*The Special Theory of Relativity: A Critical Analysis*, p. 8).

[852] William F. Magie, "The Primary Concepts of Physics," *Science*, vol. XXXV, Feb. 23, 1912, cited in Loyd S. Swenson, Jr., *The Ethereal Ether*, 1972, p. 177.

[853] "Zur Elektrodynamik bewegter Körper," *Annalen der Physik*, 4th series, 17, Sept. 26, 1905.

> It is at this point that the difference between the ideas of Fitzgerald, Lorentz, and even Poincaré, and the ideas of Einstein, begins to appear. For his predecessors, the Lorentz transformation was merely a useful tool for linking objects in relative motion; for Einstein it was not a mathematical tool so much as a revelation about nature herself. As he wrote years later, he had seen "that the bearing of the Lorentz transformation transcends its connection with Maxwell's equations and was concerned with the nature of space and time in general….For with his Special Theory Einstein was not so much propounding an idea as revealing a truth of nature that had previously been overlooked….it was a property of the way in which God had made the world.[854]

We see an acute irony in Clark's description. Whereas God had stated in the revelation of Scripture that the Earth was motionless, Clark regards the opposing view, Special Relativity, as an alternate "revelation" from "God," and Einstein is his prophet. Another biographer, Abraham Pais, put Einstein on a similar pedestal:

> A new man appears abruptly, the 'suddenly famous Doctor Einstein.' He carries the message of a new order in the universe. He is a new Moses come down from the mountain to bring the law and a new Joshua controlling the motion of heavenly bodies….The new man who appears at that time represents order and power. He becomes the θεῖος ἀνήρ, the divine man, of the twentieth century.[855]

According to these biographers, everyone except Einstein had "overlooked" that the contraction of time and space was a "fact of nature." Of course, many previous to Einstein were convinced God had already "revealed" the Earth does not move, and therefore time and physical dimensions always stay the same. In their view, anyone coming in the name of God with a different "revelation" would be considered a false prophet, much like Pharaoh's magicians who used their formulas to mimic Moses.[856] The irony, (which is, perhaps, the same that confounded Pharaoh's magicians when they discovered they could only mimic 30% of

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[854] *Einstein: The Life and Times*, pp. 120-121.

[855] Abraham Pais, *Subtle is the Lord,* 1982, 2005, p. 311. The phrase θεῖος ἀνήρ is the Greek for "divine man."

[856] *Cf*, Exodus 7:10-12; Deuteronomy 13:1-5.

Moses' miracles), is Clark proceeds to point out that Einstein's disciples could not figure out whether this God-revealed "fact of nature" was prophetically fulfilled:

> The difference between the earlier view and that of Einstein was exemplified by what Max Born, one of the first expositors of relativity, called "the notorious controversy as to whether the contraction is 'real' or only 'apparent.'" Lorentz had one view. "Asked if I consider this contraction as a real one, I should answer 'Yes,'" he said. "It is as real as anything I can observe." Sir Arthur Eddington, the later great exponent of Einstein, held a rather different view. "When a rod is started from rest into uniform motion, nothing whatever happens to the rod," he has written. "We say that it contracts; but length is not a property of the rod; it is a relation between the rod and the observer. Until the observer is specified the length of the rod is quite indeterminate.[857]

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[857] *Einstein: The Life and Times*, p. 120. Opposed to Eddington, some believe:
(1) "The contraction is real." Lorentz stated in 1922 that the "contraction could be photographed" (*Lectures on Theoretical Physics*, Vol. 3, Macmillan, p. 203); C. Møller writes: "Contraction is a real effect observable in principle by experiment…This means the concept of length has lost its absolute meaning" (Møller, *The Theory of Relativity*, 1972, p. 44); Wolfgang Pauli: "It therefore follows that the Lorentz contraction is not a property of a single rod taken by itself, but a reciprocal relation between two such rods moving relatively to each other, and this relation is in principle observable" (*The Theory of Relativity*, Dover Publications, 1958, pp. 12-13); R. C. Tolman: "Entirely real but symmetrical" (*Relativity Thermodynamics and Cosmology*, pp. 23-24).
(2) "The contraction is not real." E. F. Taylor and John Wheeler write: "Does something about a clock really change when it moves, resulting in the observed change in the tick rate? Absolutely not!" (*Spacetime Physics: Introduction to Special Relativity*, p. 76).
(3) "The contraction is only apparent." Aharoni writes: "The moving rod appears shorter. The moving clock appears to go slow" (*The Special Theory of Relativity*, p. 21); McCrea writes: "The apparent length is reduced. Time intervals appear to be lengthened; clocks appear to go slow" (*Relativity Physics*, pp. 15-16); Nunn: "A moving rod would appear to be shortened" (*Relativity and Gravitation*, pp. 43-44); Whitrow: "Instead of assuming that there are real, *i.e.*, structural changes in length and duration owing to motion, Einstein's theory involves only apparent changes" (*The Natural Philosophy of Time*, p. 255).
(4) "The contraction is the result of the relativity of simultaneity." Bohn writes: "When measuring lengths and intervals, observers are not referring to the same events" (*The Special Theory of Relativity*, p. 59). See also William Rosser,

As it stood, everyone agreed on a “contraction,” but no one was certain what it meant or how it should be applied. The only thing they knew for certain was they needed it to keep the Earth moving or they would soon be asking for baptism in the Catholic Church. As noted, the difference between Lorentz’s contraction and Einstein’s contraction was the means by which it occurred. Lorentz claimed the cause was ether pressure; Einstein dismissed the ether and said the cause was the “nature” of movement through space. What Einstein meant by “nature” is best described by relativist, Richard Wolfson:

Introductory Relativity, p. 37; and A. P. French, *Special Relativity*, p. 97; and Stephenson and Kilmister, *Special Relativity for Physicists*, pp. 38-39.

(5) “The contraction is due to perspective effects.” Rindler writes: “Moving lengths are reduced, a kind of perspective effect. But of course nothing has happened to the rod itself. Nevertheless, contraction is no illusion, it is real” (*Introduction to Special Relativity*, p. 25).

(6) “The contraction is mathematical.” Herman Minkowski writes: “This hypothesis sounds extremely fantastical, for the contraction is not to be looked upon as a consequence of resistances in the ether, or anything of that kind, but simply as a gift from above, – as an accompanying circumstance of the circumstance of motion” (“Space and Time,” in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, Dover Publications, 1952, p. 81).

(7) “The contraction is real but invisible.” James Terrell writes: “…the Lorentz contraction will not be visible, although correction for the finite velocity of light will reveal it to be present” (“Invisibility of the Lorentz Contraction,” *Physical Review*, Vol. 116, No. 4, Nov. 15, 1959, p. 1041).

(8) “The contraction is real and not real”: Einstein writes: “The author unjustly posited a distinction between Lorenz’s conception and my own with regard to the physical facts. The question of whether the Lorenz contraction really exists or not is deceptive. It doesn’t ‘really’ exist insofar as it doesn’t exist for a non-moving observer; it does ‘really’ exist, in that it can be proven principally through physical means for a non-moving observer” (“Zum Ehrenfestschen Paradoxon. Eine Bemerkung zu V. Variĉaks Aufsatz.” *Physikalische Zeitschrift* 12: 509-510.; Original German: “Der Verfasser hat mit Unrecht einen Unterschied der Lorentzschen Auffassung von der meinigen mit Bezug auf die physikalischen Tatsachen statuiert. Die Frage, ob die Lorentz-Verkürzung wirklich besteht oder nicht, ist irreführend. Sie besteht nämlich nicht ‘wirklich,’ insofern sie für einen mitbewegten Beobachter nicht existiert; sie besteht aber ‘irklich,’ d. h. in solcher Weise, daß sie prinzipiell durch physikalische Mittel nachgewiesen werden könnte, für einen nicht mitbewegten Beobachter.”)

> So Lorentz and Fitzgerald got it partly right, in that they correctly predicted a motion-induced contraction of material objects. But they remained philosophically mired in a relativistically incorrect way of thinking, because for them the contraction occurred against a background of absolute space and time. Theirs was a contraction of material objects in an uncontracted space. The relativistically correct interpretation of length contraction is that measures of space itself differ in different reference frames and that differing measures for the length of material objects reflect this underlying relativity of space.[858]

In other words, Lorentz's space was composed of an immovable ether. When an object moved against it, the object contracted by some sort of electrical distortion in the atoms of the object. But for Einstein, there was no physical process of atoms contracting. Since he dispensed with the ether, then obviously physical ether could not be causing a contraction on physical atoms. But this left nothing physical to cause the contraction. So Einstein postulated that space itself – even though he understood it as a vacuum that contains nothing physical – contracts when an object moves through it. It is thus the contraction of space, and we assume this includes the space between the atoms of the object that contracts, which then makes it appear as if the object itself has contracted. As Einstein himself put it:

> H. A. Lorentz was the first to introduce the hypothesis that the form of the electron experiences a contraction in the direction of motion in consequence of that motion, the contracted length being proportional to the expression $\overline{\text{¥ s F }^{6}\text{¤R}^{6}}$. This hypothesis, which is not justifiable by any electrodynamical facts, supplies us then with that particular law of motion which has been confirmed with great precision in recent years. The theory of relativity leads to the same law of motion, without requiring any special hypothesis whatsoever as to the structure and the behavior of the electron.[859]

In other words, Eisntein explicitly rejects Lorentz's explanation for the contraction but offers us no other physical or scientific reason in place of it. In Einstein's world 'it just happens 'cause it happens,' and he can then call it a "law of motion" because the experiments keep giving him the same results! This is what has passed for "science" for the last one hundred years and counting.

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[858] Richard Wolfson, *Simply Einstein: Relativity Dymystified*, 2003, p. 117.

[859] "Relativity – The Special and General Theory," in Stephen Hawking's, *A Stubbornly Persisten Illusion*, 2007, p. 168.

Big Bang science would later use the same flexible concept of space, only in reverse. Whereas Einstein said space contracted, Big Bang theoriest say space is expanding. It is amazing how versatile the "space" of modern science is, especially when it is composed of nothing. We must add, however, that in Einstein's world it is no longer just space. It is space-time. Time and space will thus contract together, since they are joined at the hip, as it were.

Why does Einstein's space-time contract? Once again, for no other reason than the fact that it is demanded by the previous "knowledge" they acquired from Copernicus and Galileo. Space-time contracts for Einstein when an object moves due to the same reason that ether causes an object to contract for Lorentz – it is because both Einstein and Lorentz "know" the Earth is moving but neither can detect its movement, which then requires the invention of an *ad hoc* process to make it appear to be moving.

For Lorentz, the syllogism turns out to be:

Major Premise: We cannot detect Earth moving
Minor Premise: We "know" Earth is moving
The Conclusion: Ether causes objects to contract when they move through it, and the contraction hides the movement of the Earth from our experimental observations.

For Einstein, the syllogism is:

Major Premise: We cannot detect Earth moving
Minor Premise: We "know" Earth is moving
The Conclusion: Space-time contracts when objects move through it, and the contraction hides the movement of the Earth from our experimental observations.

Although this replacement of Lorentz's ether with Einstein's "nature of space-time" gave a mysterious aura around Einstein's theory, the dismissal of ether and the adoption of vacuum space as his preferred frame would come back to haunt him. Within ten years Einstein was wishing to have back the ether, at least under his own terms. In 1916 Einstein wrote:

> …in 1905 I was of the opinion that it was no longer allowed to speak about the ether in physics. This opinion, however, was too radical, as we will see later when we discuss the general theory of relativity. It does remain allowed, as always, to introduce a medium filling all space and to assume that the electromagnetic fields (and matter as well) are its states…once again "empty" space appears as endowed with physical properties, *i.e.*, no longer as physically empty, as seemed to be the case according to special relativity. One can thus say that the ether is resurrected in the general theory of relativity….Since in the new theory, metric facts can no longer be separated from "true" physical facts, the concepts of "space" and "ether" merge together.[860]
>
> It would have been more correct if I had limited myself, in my earlier publications, to emphasizing only the non-existence of an ether velocity, instead of arguing the total non-existence of the ether, for I can see that with the word *ether* we say nothing else than that space has to be viewed as a carrier of physical qualities.[861]

In dispensing with ether and adopting vacuum space in its place, Einstein gave no physical reason for this mystical power of motion to change either time, dimensions or mass. As noted, it was formulated on one basis only – the two premises of his syllogism: Premise A: We can't detect Earth moving, and Premise B: We "know" the Earth moves. So, the only resolution out of this intractable conundrum was to posit that a moving Earth contracts our measuring instruments and slows down our clocks. It's like trying to fit a square peg in a round hole. The only way to accomplish the feat is to shave off some of the peg or drill out some of the hole. Pure motion became Einstein's shaver and/or drill bit. It was rather convenient, however, that the 'shaving' was just enough to mask the presumed speed of the Earth around the sun.

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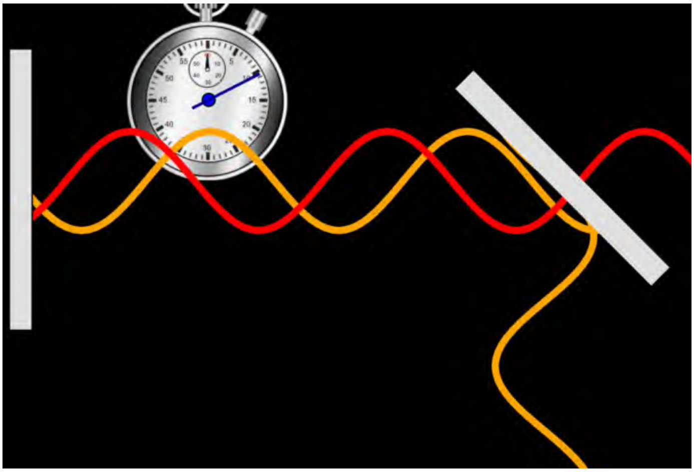
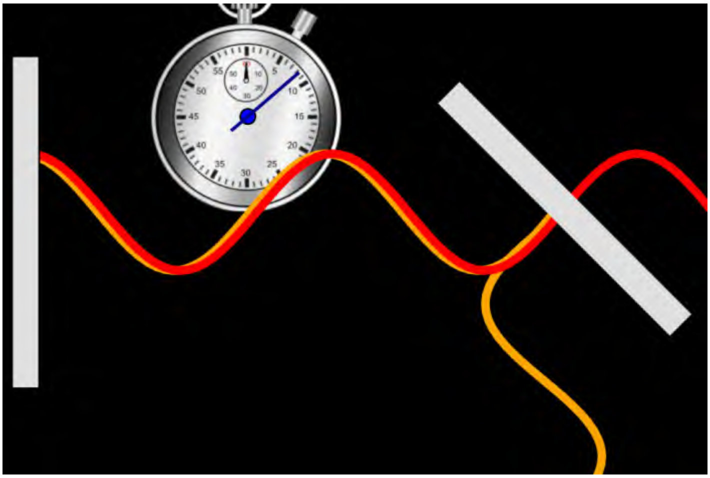
[860] Albert Einstein, "Grundgedanken und Methoden der Relativitätstheorie in ihrer Entwicklung dargestellt," *Morgan Manuscript*, EA 2070, as cited in Ludwik Kostro, *Einstein and the Ether*, Aperion, 2000, p. 2. For a good summation of Einstein's reasoning in regard to reviving the ether concept, see Galina Granek's "Einstein's Ether: Why Did Einstein Come Back to the Ether?" *Apeiron*, vol. 8, no. 3, July 2001; "Einstein's Ether: Rotational Motion of the Earth," *Apeiron*, vol. 8, no. 2, April 2001; Ludwik Kostro, "Einstein and the Ether," *Electronics and Wireless World*, 94:238-239 (1988). Kostro writes: "the notion of ether was not destroyed by Einstein, as the general public believes" (*ibid*., p. 239); "Lorentz wrote a letter to Einstein in which he maintained that the general theory of relativity admits of a stationary ether hypothesis. In reply, Einstein introduced his new non-stationary ether hypothesis" (*ibid*., p. 238).

[861] Albert Einstein, "Letter to H. A. Lorentz, November 15, 1919," EA 16, 494, as cited in Ludwik Kostro, *Einstein and the Ether*, *Aperion*, 2000, p. 2.



Expected results of the Michelson-Morley experiment: waves separated due to presumed motion of Earth; ticking clock is unaffected; keeps normal time



Contrived results: light waves coalesce because the contracting space contracts the longitudinal arm of the apparatus. Time also contracts because it is an integral part of space (i.e., "spacetime")

The "masking" would then be turned into a mathematical equation to be used as the foundation for every motion problem faced in modern physics. In the end, as motion changed the physics of the universe, and since everything was in motion, then there could be no absolutes. Essentially, the "Principle of Relativity" became the only absolute. As physicist John Norton puts it:

> That Einstein should believe the principle of relativity should not come as such a surprise. We are moving rapidly on planet earth through space. But our motion is virtually invisible to us, as the principle of relativity requires.[862]

Notice that the "principle of relativity" makes sweeping demands on how physics is to be understood, yet this very "principle" was derived by presuming as fact the very thing that the empirical evidence could not determine as fact – a moving Earth. It is no exaggeration to say, then, that the whole of modern physics is based on the unproven premise that the Earth is moving, and that modern physics will fall like a house of cards once it is realized that "the Earth stands firm."

As we noted earlier, after Galileo and Newton dispensed with a motionless Earth, their followers subsequently had to depend on the ether to give them an absolute and universal frame of reference. After Einstein dispensed with ether, there was no longer any absolute reference point. But no theory can work without some kind of absolute. Even the theory of Relativity needs an absolute to serve as the standard from which all other things are measured. For Einstein, there was only one absolute left, the speed of light. Although it would be like trying to grasp a cloud, the speed of light would have to serve as the giant ruler to measure all things in the universe. Even today astronomers use it to measure the distance to the stars in "light-years."[863] Since for Einstein there was no longer ether to impede light's speed, light could remain an absolute throughout the whole universe. The speed of light is the foundation for all of modern physics. As one author put it:

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[862] "Special Theory of Relativity: The Basics" in *Einstein for Everyone*, classnotes by professor John D. Norton, University of Pittsburgh, p. 4. Norton adds: "No experiment aimed at detecting a law of nature can reveal the inertial motion of the observer. Absolute velocity has no place in any law of nature" (p. 3).

[863] A "light year" is the distance light travels in a year at a speed of 299,792,459 meters/second. According to current theory, the nearest stars, *Proxima Centauri* and *Alpha Centauri*, are 4.3 light-years from Earth.

> Einstein made space and time relative, but in order to do this he had to take something else, which was the velocity of light, and make it absolute. The velocity of light occupies an extraordinary place in modern physics. It is *lèse-majesté* to make any criticism of the velocity of light. It is a sacred cow within a sacred cow, and it is just about the Absolutest Absolute in the history of human thought. There is a text book on physics which openly says, "Relativity is now accepted as a faith." This statement, although utterly astounding in what purports to be a science, is unfortunately only too true.[864]

No proof for the constant speed of light was offered by Einstein. It was only measured in terrestrial environments as propagating at 300,000 km/sec, and nothing, of course, could be concluded about how fast light could travel in deep space.[865] In short, there was no empirical evidence that the speed of light was constant. It was merely a "postulate" required by the "principle of relativity." But the principle of relativity was based on the presumed but unproven notion that the Earth was moving; and consequently, in order to keep light moving at a constant speed of *c*, time and space had to be contracted, and since they both contracted by the same amount (*i.e.*, the Lorentz transform equation), then they were virtually one entity, "spacetime." In the end, it can be said that a constant speed of light was required as a consequence of presuming the Earth was moving, even though it could not be detected moving.

The "Observer"

Whereas prior to Copernicus the absolute was a motionless Earth, and for Galileo and Newton it was a motionless space, for Einstein it became the observer viewing the absolute speed of light entering his retina. As Herbert Dingle puts it:

> An almost equally effective means of escaping difficulties is the introduction of 'the observer.' When the Einstein theory appears to lead to incompatible objective results, they are written off as

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[864] Anthony Standen, *Science is a Sacred Cow*, 1952, pp. 52-53, referring to Robert A. Houstoun book: *Treatise on Light*, Longmans, Green and Co, 1946.

[865] This also meant that if someday someone discovered that light's speed varied in the same medium, it would be the immediate demise of Relativity.

> merely different *appearances*, but claimed as *realities* when some actual phenomenon has to be explained.[866]

Obviously, if light is the only absolute in the universe yet its speed is finite, Einstein had to compensate for this annoying limitation in some fashion. Thus he postulated that each observer sees the light coming into his eyes as an absolute speed. Virtually every idea and formula surrounding Special Relativity is based on "what the observer sees." More specifically, each "observer" is said to have his own "inertial frame of reference." If there were a million observers to an event, there would be a million inertial frames of reference, and Relativity can create as many observers, and thus inertial frames, as it needs to reinforce its theory.[867]

The inordinate creation of an infinite variety of inertial frames relates directly to the heliocentrism versus geocentrism issue. As one modern physics text explains concerning the two sides of the debate:

> …within a century of Copernicus' death the heliocentric model had been fully accepted by the scientific community….This is because the objections to relativity that had seemed so irrefutable since ancient times could now be answered, but only because of a profound re-interpretation of the relativity principle brought about by the successors of Copernicus, including Kepler, Galileo, Descartes, Huygens, and Newton. These men developed a physically viable theory of relativity based not on purely kinematical relations, but on the dynamical principle of inertia,

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[866] *Science at the Crossroads*, p. 180. For a summation to Einstein's view that in "Relativity: There is no hitching post in the universe – so far as we know," Einstein retorted: "Read, and found correct" (*Einstein: The Life and Times*, p. 521). Of note, Max Planck, a firm supporter of Special Relativity and an equally firm opponent of Ernst Mach's view that "nothing is real except the perceptions," held the ironic position that the basic aim of science is "the finding of a *fixed* world picture independent of the variation of time and people…the complete liberation of the physical picture from the individuality of the separate intellects" (cited in Holton's *Thematic Origins of Scientific Thou*ght, p. 245, emphasis his). Since Relativity did not give Planck what he desired and, in fact, based everything on the "observer" who had "variation of time" and a "separate intellect," we wonder if he would have been amenable to a "fixed" Earth to satisfy his search. Einstein gave him anything but that.

[867] An inertial frame is the foundation frame, the place of no change. If the foundation is not moving, the law of inertia says it remains motionless; if it is moving, the same law says it remains in motion unless compelled upon by a net external force. The opposite is an accelerated frame, which is considered non-inertial.

> according to which there exists an infinite class of relatively moving coordinate systems that are all equivalent from the standpoint of mechanical dynamics. The principle of relativity founded on the concept of inertia became the operational basis of the Scientific Revolution.[868]

Later in the same book, the author attempts to use the "concept of inertia" for at least circumstantial evidence for the Copernican solar system, but in the end he admits that it offers no solid proof:

> The historical parallel between Special Relativity and the Copernican model of the solar system is not merely superficial, because in both cases the starting point was a pre-existing theoretical structure based on the naive use of a particular system of coordinates lacking any inherent physical justification. On the basis of these traditional but eccentric coordinate systems it was natural to imagine certain consequences, such as that both the Sun and the planet Venus revolve around a stationary Earth in separate orbits. However, with the newly-invented telescope, Galileo was able to observe the phases of Venus, clearly showing that Venus moves in (roughly) a circle around the Sun. In this way the *intrinsic* patterns of the celestial bodies became better understood, but it was still possible (and still *is* possible) to regard the Earth as stationary in an absolute extrinsic sense. In fact, for many purposes we continue to do just that, but from an astronomical standpoint we now almost invariably regard the Sun as the "center" of the solar system. Why? The Sun, too, is moving among the stars in the galaxy, and the galaxy itself is moving relative to other galaxies, so on what basis do we decide to regard the Sun as the "center" of the solar system?
>
> The answer is that the Sun is the *inertial* center. In other words, the Copernican revolution (as carried to its conclusion by the successors of Copernicus) can be summarized as the adoption of *inertia* as the prime organizing principle for the understanding and description of nature. The concept of physical inertia was clearly identified, and the realization of its significance evolved and matured through the works of Kepler, Galileo, Newton, and others. Nature is most easily and most perspicuously described

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[868] *Reflections on Relativity*, "Math Pages," Preface. Internet study course on Special and General Relativity (www.mathpages.com), author's name not given.

> in terms of inertial coordinates. Of course, it remains possible to adopt some non-inertial system of coordinates with respect to which the Earth can be regarded as the stationary center, but there is no longer any imperative to do this, especially since we cannot thereby change the fact that Venus circles the Sun, *i.e.*, we cannot change the intrinsic relations between objects, and those intrinsic relations are most readily expressed in terms of inertial coordinates.[869]

Notice how the author seeks to make an impression on his reader so as to convince him that the Copernican model is the true system. We know this is his goal since he stated it very plainly: "so on what basis do we decide to regard the Sun as the "center" of the solar system?" Being an avowed Copernican, he, of course, chooses the sun as his center based on the principle of "inertia" (although he offers no proofs for his choice). Perhaps convicted by his intellectual conscience, however, he then admits it is still "possible to adopt…the Earth…as the stationary center," but his only excuse for not doing so is that, in his opinion, "there is no longer any imperative to do this," and as he sees it, having a system of "inertial coordinates" is preferable to having only one inertial point, the Earth, as the center. We must add that the author's arbitrary choice comes from a 600-page treatise that is saturated with everything from philosophical analysis, to elaborate charts and graphs, to dozens of pages of differential calculus, all very impressive and all seeking to support Special and General Relativity. Although he opens his Preface asserting the correctness of Copernicanism ("…within a century of Copernicus' death the heliocentric model had been fully accepted by the scientific community….This is because the objections to relativity that had seemed so irrefutable since ancient times could now be answered"), he then admits that neither Newtonian mechanics nor Relativity theory provides him with any proof. Instead, he relies on an old but useful canard from Galileo concerning "the phases of Venus" to convince his reader heliocentrism is true, a fallacy we exposed in Chapter 2.

In the end, Einstein's attempt to base physics on arbitrarily selected inertial systems wherein each observer is his own preferred reference frame is akin to a universe in which, to borrow a cliché, 'everyone lives in his own little world.' If there is no immovable Earth, then each observer will act as his own immovable frame, and all the laws of motion will act upon him as if he were an absolute. As D. and S. Birks state:

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[869] *Reflections on Relativity*, "Math Pages," Internet study course on Special and General Relativity (www.mathpages.com), pp. 523-524, emphasis added, author's name not given.

> Einstein theorized...that the movement of light is a mathematical absolute for any circumstance of motion...Where Ptolemy theorized a geocentric universe, Einstein, upon the basis of the Michelson-Morley experiment, theorized a "light-centric" universe... In essence, Einstein theorized a "self-centric" universe, where the entire universe of the individual conforms to the individual's motion.[870]

As Fresnel used his "drag" mathematics rather than physical experiments to dismiss the geocentric implications of the Arago and Airy experiments, Einstein took up the mantle and forged ahead much farther, changing time, dimensions and mass in Special Relativity and introducing the complex equations of tensor calculus and non-Euclidean geometry of General Relativity to explain Fresnel's hitherto unexplainable astral phenomena. As Einstein saw it, Fresnel had "failed" due to his insistence on incorporating ether into the equation, so Einstein had to tweak Fresnel's equations, while at the same time dismiss the ether. How does one do this? Rely on the wax nose of your whole theory, "the observer," to make things fit as they need be. In this case, the velocity of light that went through Airy's telescope is framed in terms of the "observer":

> "…*as seen by the observer* [it] is changed by the fraction $1-1/\eta^2$…No assumption of any 'dragging' is involved in the relativity arguments, nor is the existence of an ether even postulated."[871]

Of course, the obvious question that arises in this situation is: if two observers are moving relative to each other, then the length for one observer as compared to the other should be less by a factor of $1 - 1/\eta^2$, but since there is no preferred observer, this would mean that each observer must see the other as being shorter, which is an obvious contradiction. Relativity theory attempts to answer this paradox. As Martin Gardner explains it for the student:

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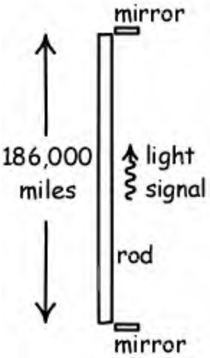
[870] "A Disproof of Relativity (Relativity as a Mathematical Virus)," by D&S Birks, *The General Science Journal*, http://gsjournal.net/Science-Journals /Research%20Papers-Relativity%20Theory/Download/ 1215.

[871] Quoted from *Fundamentals of Optics*, Francis Jenkins and Harvey White, 1957, pp. 404-405, cited in *De Labore Solis*, p. 46, emphasis added.

> For Lorentz and Fitzgerald the contraction was a physical change, caused by pressure of the ether wind. For Einstein it had only to do with the results of measurement… Lorentz and Fitzgerald still thought of moving objects as having absolute "rest lengths." When the objects contracted, they were no longer their "true" lengths. Einstein, by giving up ether, made the concept of absolute length meaningless. What remained was length as measured, and this turned out to vary with the relative speed of the object and observer….How is it possible for each ship to be shorter than the other? You ask an improper question. The theory does not say that each ship is shorter than the other; it says that astronauts on each ship measure the other ship as shorter.[872]

What, precisely, causes "each ship to measure the other ship as shorter," Gardner does not explain, except to refer to a "thought experiment" about similar changes in the slowing down of time. He writes:

> Imagine that you are looking out through the porthole of one spaceship into the porthole of another ship. The two ships are passing each other with a uniform speed close to that of light. As they pass, a beam of light on the other ship is sent from its ceiling to its floor. There it strikes a mirror and is reflected back to the ceiling again.



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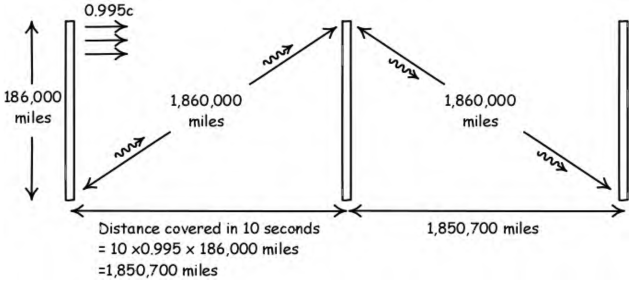
[872] *Relativity Explosion*, pp. 50-51.

> *You will see the path of this light as a* V.[873]



> Now suppose that while you clock the light beam on its V-shaped path, an astronaut inside the other ship is doing the same thing. From his point of view, assuming his ship to be the fixed frame of reference, the light simply goes down and up along the same line, obviously a shorter distance than along the V that you observed. When he divides this distance by the time it took the beam to go down and up, he also obtains the speed of light. Because the speed of light is constant for all observers, he must get exactly the same final result that you did: 299,800 kilometers per second. But his light path is shorter. How can his result be the same? There is only one possible explanation: his clock is slower.[874]

Gardner's is one of the most popular explanations for the rationale behind Special Relativity. The fact is, however, it is very misleading. First of all, man has not reached anywhere near the speed of light, and thus we certainly do not know for certain what would happen if we did. Gardner's explanation is based on *gedanken*, *i.e.*, thought experiments without empirical evidence. But for the sake of argument, let's assume we could travel at near the speed of light. In that case we are told that the only way to explain the discrepancy is that one of the clocks runs slower due to motion, thus implying that time itself slows down due to motion. But does it? Logically, the same time will pass whether the spaceship experiment is performed or not. The only thing that Gardner knows for sure is that light does not make a good clock if the observer who is keeping time is traveling near the speed of light. In other words, Gardner cannot exploit the limitations on the speed of light to conclude that time slows down for moving objects. If clocks slow down it does not mean that time slows down. It only means that something is making the clock tick slower. If, for example, the clock is moving against ether, then a resistance will be created, and the clock rate will vary depending on the density of the ether at a given location.[875]

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[873] These graphs are taken from John D. Norton's paper, "Special Theory of Relativity: The Basics" in *Einstein for Everyone*, pp. 5-10, since he uses the same argument as Gardner.

[874] *Relativity Explosion*, pp. 52-53, emphasis added.

Gardner then shows another facet of his theory:

> Consider, for example, this simple situation. A spaceship, traveling at three-fourths the speed of light, passes overhead going due east. At the same instant another spaceship, also traveling at three-fourths the speed of light, passes overhead going due west. From your frame of reference, attached to the inertial frame of the Earth, the two ships pass each other with a relative velocity of one and one-half times the speed of light. They approach at that speed, move apart at that speed. There is nothing in relativity theory to deny this. However, the special theory does insist that if you were riding on either ship, you would calculate the relative speed of the ships to be less than that of light.[876]

The problems with Gardner's thought experiment are quite evident. First, his own Relativity theory will not allow him to assume that the observer is "attached to the inertial frame of the Earth." Relativity holds that, in addition to the Earth's rotational and translational motion, it is in relative motion to the spaceships, and thus Earth cannot arbitrarily serve as "an inertial frame." Tempting as it may be for him, Gardner cannot use geocentric principles in order to answer the anomalies in his non-geocentric universe.

Second, Gardner's attempted explanation of the anomaly (which insists: "if you were riding on either ship, you would calculate the relative speed of the ships to be less than that of light") only misleads the reader. Gardner has already admitted that the *true* relative speed of the ships (as observed from an inertial Earth) is "one and one-half the speed of light." Obviously, then, a "calculation" by one of the ships that measures a relative speed less than the speed of light is simply an erroneous calculation. It is erroneous because, in order to know the *true* calculation, he must triangulate his measurement of the other ship with the inertial

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[875] See Dr. Robert Bennett's explanation of the V-shape appearance of the light for the observer in Appendix 4.

[876] *Relativity Explosion*, p. 62.

Earth, which will then give him the precise relative speed of his ship compared to the other ship. But Gardner conveniently eliminated the inertial Earth's part in this "thought experiment" in the second leg of his paragraph.

We find the same kind of special pleadings in college physics textbooks. In attempting to explain the famous "twin paradox," one text states:

> But what about the traveling twin? If all inertial frames are equally good, won't the traveling twin make all the claims the Earth twin does, only in reverse?….They cannot both be right, for after all the spacecraft returns to Earth and a direct comparison of ages and clocks can be made. There is, however, not a paradox at all. The consequences of the special theory of relativity – in this case time dilation – can be applied only by observers in inertial reference frames. The Earth is such a frame (or nearly so), whereas the spacecraft is not.[877]

Once again, the author assumes Earth is an "inertial frame" but Relativity will not allow this choice since relative motion can never be determined to be uniform. We can sense that the author is hesitant to make Earth an inertial frame for he adds the qualification "or nearly so." He knows that in his preferred cosmology the Earth is at least understood to be moving through space by its own rotation and translation, not to mention that it is also carried by the sun's movement through the galaxy, and the galaxy's movement through other groups of galaxies, and so on, *ad infinitum*. For all he knows, compared to some fixed point the Earth could be accelerating in many different frames, which would hardly make it an "inertial frame." Moreover, the simple fact that the author has made Earth an inertial frame implies the validity of geocentrism and shows that Relativity lacks the ability to solve its own paradoxes without depending on geocentrism. The way around this problem is to invoke the Lorentz transform to make it appear as if Earth is an inertial frame. The irony in that solution, as we have seen, is that the Lorentz transform was invented in order to answer the Michelson-Morley experiment that showed the Earth was motionless in space! A magician couldn't use smoke and mirrors better than modern physics has.

Another attempted explanation of the twin paradox claims that although the one twin zooms away from earth at uniform speed, the instant that he turns around to come back to earth means that the "relativistic frame" has changed from inertial (uniform speed) to non-inertial (acceleration), and since Special Relativity does not include acceleration, then we cannot impose upon it to answer the paradox! As G. Burnison Brown notes:

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[877] *Physics: Principles with Applications*, fourth edition, Douglas Giancoli, 1995, p. 757.

> The most outstanding contradiction is what the relativists call the clock paradox.... It is not possible for each of two clocks to go slower than the other. There is thus a contradiction between the Lorentz transformations and the principle....
>
> A more intriguing instance of this so-called "time dilation" is the well-known 'twin paradox,' where one of two twins goes for a journey and returns to find himself younger than his brother who remained behind. This case allows more scope for muddled thinking because acceleration can be brought into the discussion. Einstein maintained the greater youthfulness of the travelling twin, and admitted that it contradicts the principle of relativity, saying that acceleration must be the cause (Einstein 1918). In this he has been followed by relativists in a long controversy in many journals, much of which ably sustains the character of earlier speculations which Born describes as "monstrous" (Born 1956).
>
> Surely there are three conclusive reasons why acceleration can have nothing to do with the time dilation calculated:
>
> (i) By taking a sufficiently long journey the effects of acceleration at the start, turn-round and end could be made negligible compared with the uniform velocity time dilation which is proportional to the duration of the journey.
>
> (ii) If there is no uniform time dilation, and the effect, if any, is due to acceleration, then the use of a formula depending only on the steady velocity and its duration cannot be justified.
>
> (iii) There is, in principle, no need for acceleration. Twin A can get his velocity V before synchronizing his clock with that of twin B as he passes. He need not turn round: he could be passed by C who has a velocity V in the opposite direction, and who adjusts his clock to that of A as he passes. When C later passes B they can compare clock readings. As far as the theoretical

> experiment is concerned, C's clock can be considered to be A's clock returning without acceleration since, by hypothesis, all the clocks have the same rate when at rest together and change with motion in the same way independently of direction. [I am indebted to Lord Halsbury for pointing this out to me.][878]

Relativists are saddled with constant absurdities that arise from their theory. For example, Relativity holds that if a person, moving at the speed of light, is chasing a particle in a light beam ahead of him, the particle will continue to increase its distance from the person at the speed of light; whereas previous to Einstein, it was understood that light's speed was constant only with respect to the ether, not the observer. As Einstein himself said:

> "If I pursue a beam of light with the velocity *c*, I should observe such a beam of light as a spatially oscillatory electromagnetic field at rest. However, there seems to be no such thing, whether on the basis of experience or according to Maxwell's equations."[879]

But as E. Butterfield wrote to Herbert Ives:

> I just can't see riding on a moon beam at its take-off and having it get 300,000 km ahead of me in the first second. If that's what Einstein means by the constancy of the velocity of light, then his whole structure falls to the ground as soon as somebody kicks that out, for that is the keystone.[880]

Or as John Norton noted:

> This thought experiment has proven immensely popular in accounts of the discovery of special relativity. Who could not

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[878] "What is wrong with Relativity?" G. Burniston Brown, Vol. 18, 1967, p. 74.

[879] *Autobiographical Notes*, written in 1946, published in 1949, cited in Holton's *Thematic Origins of Scientific Thought*, pp. 311, 359. Van der Kamp concludes: "And deliberately set against the possibility of an Earth-centered cosmos he [Einstein] has persuaded all those on that score agreeing with him to put their faith in an ontological impossibility. That is: with whatsoever speed we approach or leave a light source, our instruments register the appropriate Doppler shifts but measure the velocity of radiation received as if we are at rest with regard to the source" (*De Labore Solis*, p. 95).

[880] April 24, 1951, cited in *The Einstein Myth*, p. 136.

> fail to be charmed by the image of a precocious sixteen year old whose innocent imaginings lay the groundwork for a great discovery? What is rarely mentioned, however, is that the thought experiment does not quite make sense.[881]

Having rejected an immobile Earth and even the theoretical existence of ether, Relativists can find no other viable solutions to the complexities of macro physics, and thus are more or less forced to absurd and obtuse positions which can only be presented by even more obtuse mathematics.

Herbert Dingle's Critique of Einstein

Since these issues are so important, we should review and flesh them out a bit more. Since Einstein discarded absolute rest and the ether, his only method of filling in the gaps was to make time and space the variables, yet keep light as the constant.[882] Dingle writes:

> …Einstein's special relativity theory…has nothing to do with time in the sense of "eternity"; it is concerned only with *instants* and *durations*… creating the illusion…that it has something to

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[881] *Einstein's Investigations of Galilean Covariant Electrodynamics Prior to 1905*, John D. Norton, University of Pittsburgh, Dept. of History and Philosophy of Science, Jan. 28, 2004, pp. 28-29. Norton goes on to show the impracticalness of the thought experiment, as well as showing how Maxwell's equations demonstrate that "rapid motion would bring the light to rest…the wave has been brought to rest; it is a frozen sine wave ('spatially oscillating')." Norton adds, however, that "no field law expressed in differential equations can (a) be an emission theory of light; (b) be a Galilean covariant, even with field transformation laws; and (c) characterize light waves by intensity, color and polarization alone." Louis Essen adds: "A thought-experiment…cannot provide new knowledge; if it gives a result that is contrary to the theoretical knowledge and assumptions on which it is based, then a mistake must have been made. Some of the results of [Einstein's] theory were obtained in this way and differ from the original assumptions (Essen 1957, 1963a, 1965, 1969). Einstein himself calls one of the results peculiar, but in fact it must be wrong, since it disagrees with the initial assumptions.…The fact that the errors in the theory arise in the course of the thought-experiments may explain why they were not detected for so long" (*The Special Theory of Relativity: A Critical Analysis*, pp. 2-3). Later Essen observes: "…making the velocity of light have the constant value *c* even to observers in relative motion is comparable to making it a unit of measurement…The contraction of length and the dilation of time can now be understood as representing the changes that have to be made to make the results of measurement consistent" (*ibid*., p. 6).

[882] The equation takes the form $t' = t - vx/c^2 / \sqrt{(1 - v^2/c^2)}$.

say…about the *nature* of "time," of the continuum that St. Augustine and Kant and other philosophers have puzzled themselves about. In fact, time, the ever-rolling stream, has no more to do with the existence of clocks than with that of sausages, while time, in Einstein's theory as in physics in general, means only clock-readings. It is because of this confusion that the "experimenters" have left relativity to the "mathematicians"…They are accepted as such, without understanding but with blind trust….It was Minkowski who later took the fatal step of introducing "eternity" into the theory…When once the distinction between eternity, instant and duration is recognized, the general literature of the subject of relativity is seen to be in utter confusion. The writer, quite unaware that the word "time" has different meanings, unconsciously oscillates between them, and the reader, equally unconsciously, becomes the victim of one non sequitur after another, in which he can see no failure of reasoning but yet no possibility of making sense of the conclusion: thus is generated the illusion that relativity is incomprehensible to the ordinary mind….If one spoke of the time (instant) of a distant event…in the absence of any self-evident, necessary way of determining such an instant, Einstein claimed the right to define it in such a way as to save the electromagnetic theory without violating the principle of relativity of motion. Furthermore, he succeeded in discovering such a definition. It was a veritable stroke of genius, but it is

Herbert Dingle (1890 – 1978)

> most important to notice this: Einstein had not *disproved* Newton's implied requirement that the rate of a clock was not affected by uniform motion; he had only shown it was a necessary requirement, and that, in the absence of evidence to the contrary, any other self-consistent assumption about the effect of motion on the rate of a clock was permissible….[883]

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[883] *Science at the Crossroads*, pp. 134-136, 145. Harold Nordenson adds that Einstein's fallacy is "the indiscriminate use of the word 'time' in two different meanings which makes his theory untenable from a logical point of view" (*Relativity, Time and Reality*, 1969, p. 120). Defending Minkowski in a letter to Dingle, Max Born writes:

> "The simple fact that all relations between space co-ordinates and time expressed by the Lorentz transformations can be represented geometrically by Minkowski diagrams should suffice to show that there can be no logical contradiction in the theory [of relativity]."

Dingle responds:

> "The error here lies in oversight of the fact that a physical theory must contain not only a mathematical structure but also a correlation between the mathematical symbols and observable quantities: a perfectly logical theory may therefore fail physically in the second of these requirements. This oversight calls for much more general consideration, because it characterizes almost the whole of modern physical theory, in which so often a mathematical possibility is assumed automatically to be a physical possibility also, whereas mathematical symbols have a far wider range of significance than is possible to the physical objects whose properties they are taken to represent. The equations, $8 - 6 = 2$ and $6 - 8 = -2$, are mathematically valid and equivalent examples of the general equation, $a - b = c$. They are both geometrically applicable to a physical situation: thus, if we walk 8 miles north (+) and then 6 miles south (-) we end 2 miles north of our starting point; and if we walk 6 miles north and then 8 miles south we end 2 miles south of our starting point. But they are not both applicable to physical objects: you can get 6 apples from 8 by leaving 2 behind, but you cannot get 8 apples from 6 by leaving –2 behind. If Professor Born's argument were sound we should be able to say: the simple fact that all numerical values of a, b and c expressed by the equation $a - b = c$ can be represented geometrically by lines drawn to north and south should suffice to show that there can be no logical contradiction (and, by implication, nothing wrong) in the theory that you can get 8 apples from 6" (*Science at the Crossroads*, pp. 231-232).

Einstein must dilate time because all his "observers" are moving. They all see light, but they all see it at different times, and there is no stationary Earth from which to judge who of the observers has the right time.[884] As they say, "everything is relative." Einstein himself said that he

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[884] The difference in the time between the two observers will be: $1/\sqrt{(1- v^2/c^2)}$, which is the same equation Lorentz used for time/length contraction, but at least Lorentz was basing his on the fact that the ether constituted absolute time and distance. Einstein had no such luxury. In any case, as Dingle states:

> …the assumption of the Lorentz transformation in mechanics requires one clock to work both faster and slower than another. The fact that this can be seen to be contradictory in advance of observation, whereas the result of the Michelson-Morley experiment could not be foreseen, is due simply to the fact that we already know far more about clocks than about light…and we know enough about clocks to know that one cannot, at the same time and in the same sense, be working both faster and slower than another" (*Science at the Crossroads*, p. 235).

Later he writes:

> If Einstein's theory is valid the following questions arise. How is it possible for the ratio of the intervals recorded by two identically constructed, regularly running clocks, between the same pair of events, to vary with the events chosen (in other words, how can the ratio of two constant quantities be variable)? Second, if it is possible, why must the events that alone give the 'correct' ratio be chosen from the set occurring on one and not the other of the clocks? Third, if they must be so chosen, how does one (consistently with a theory in which the only feature in which the clocks differ – motion – can be ascribed indifferently to one of the other) discover on which clock the valid set of events occurs? I think it is self-evident that these questions are unanswerable. There can be no doubt that, if this criticism of the theory had been made in 1906, it would at once have been seen to be fatal and Einstein would have been the first to acknowledge it, for then reason was the *de facto* as well as the *de jure* arbiter in such a matter. In 1967, however, the obvious has become the inconceivable, and it has to meet the prejudice, independent of reason, that every apparent objection to special relativity is merely evidence of incomprehension and can accordingly be ignored" (*ibid*., pp. 237-238).

Essen says that Dingle's objection is correct "if the equations given by Einstein are used" but "the apparent contradiction is avoided [only] if we interchange the symbols." Essen goes on to comment:

> Dingle's treatment of the problem deserves special mention because he was the first to point out…that the clock paradox result was an actual mistake in Einstein's paper (Dingle, *Nature*, London 177, 782, 1956). He attributes the mistake to the fact that the Lorentz transformations in two different directions do not commute…he argues more generally that if Einstein's arguments are valid the result must be symmetrical, and he [Einstein] uses the Lorentz transformations to obtain the result that the moving clock is both faster and slower than the stationary one.

Essen concludes:

> …the theory [Einstein's] consists in a number of contradictory assumptions and adds nothing significant to that of Lorentz….As in the clock-paradox thought experiment, it is implied that the result follows from the time-dilation prediction, but in fact an additional assumption is made which contradicts the relativity principle….It is one of [Einstein's] basic postulates that two observers in relative motion will obtain the same results from physical measurements, but, as Culwick (1959) has pointed out, no experiment of this kind has ever been performed….Another result often quoted in support of the theory is the variation of the life-time of mesons, the life-time being greater the greater the velocity of the mesons. Again it is an important result, but it cannot be regarded as a confirmation of relativity theory (*The Special Theory of Relativity: A Critical Analysis*, pp. 9, 17-20).

In another article Essen writes:

> One of the predictions of the theory was that a moving clock goes more slowly than an identical stationary clock. Taking into account the basic assumption of the theory that uniform velocity is purely relative, it follows that each clock goes more slowly than the other when viewed from the position of the other…there is no way of distinguishing between the two…This result is known as the clock paradox or, since the clocks are sometimes likened to identical twins, one of whom ages more slowly than the other, the twin paradox…Some years later, in 1918, he used another thought-experiment in an attempt to answer criticisms of the paradox result. One of the clocks again made a round trip, the changes of direction being achieved by switching gravitational field on and off at various stages of the journey, the time recorded by the moving clock was less than that recorded by the stationary clock. The result did not follow from the experiment, but was simply an assumption slipped in implicitly during the complicated procedure. The slowing down of the clocks which he had previously attributed to uniform velocity, acceleration having no effect, he now attributed to acceleration, a line of argument followed in many textbooks. (Louis

based his theory on a "free will…definition of simultaneity," a definition he said was purely arbitrary and unverifiable.[885] Relativity attempts to compensate for this anomaly by claiming that each person has his own "frame of reference" for which the laws of motion will always work the same, and thus each observer can consider himself "at rest." The logical criticism of this solution is to ask: "what frame?" and "what reference?" "Frames" and "references" are convenient words for assuming that there can be some place of absolute measurement against which to measure the frames and references. It seems that Relativity wants it both ways. It wants the observer "at rest" but also declares that he is in motion. In Relativity, everything depends on what "the observer" sees, since he has no stationary Earth upon which to rest and judge all motion in the universe.[886]

Dingle was relentless in pointing out these contradictions in Einstein's theory. He writes:

> It was almost inevitable that this paradox should arise from Einstein's 1905 paper describing the special theory, from which I quote the following passage:
>
> "If at the points A and B of [the coordinate system] K there are stationary clocks which, viewed in the stationary system, are synchronous; and if the clock at A is moved with the velocity *v*

Essen, "Relativity – Joke or Swindle?" *Electronics and Wireless World*, February 1988, pp. 126-127).

It is worthy to note that Dr. Louis Essen, inventor of the atomic clock, was marginalized for his criticism of Einstein and threatened with loss of tenure if the criticisms persisted. The *London Daily Telegraph* carried this obituary of him in September 1997: "Essen put forward his criticisms so vehemently that he eventually came to be regarded as an anti-Establishment troublemaker. He was even warned that his promotion prospects, and thus his pension, might be affected if he did not desist."

[885] *Relativity: The Special and General Theory*, 15th edition, 1961, ch. 7, p. 23. See also Arthur Lovejoy's 1930 article "The Dialectical Argument against Absolute Simultaneity" in which he critiques Einstein's famous thought experiment of "lightening flashes on the railway embankment" (summary in *The Einstein Myth*, pp. 4-6); Geoffrey Builder, *Australian Journal of Physics* 11 [1958]: 457-480 for a critique on Einstein's arbitrary simultaneity; See also Arthur Lynch's, *The Case Against Einstein*, 1932, pp. 120-130 for a comprehensive mathematical and logical critique of Einstein's simultaneity.

[886] Clark writes: "As Einstein wrestled with the cosmological implications of the General Theory, the first of these alternatives, the Earth-centered universe of the Middle Ages, was effectively ruled out" (*Einstein: The Life and Times*, p. 267).

> along the line AB to B, then on its arrival at B the two clocks no longer synchronise, but the clock moved from A to B lags behind the other which has remained at B by ½ $t\ v^2/c^2$ (up to magnitudes of fourth and higher order), t being the time occupied in the journey from A to B. It is at once apparent that this result still holds good if the clock moves from A to B in any polygonal line, and also when the points A and B coincide."
>
> From this it follows that Einstein chose Y as the correct solution, and therefore must have rejected X. But he did not disprove X, which seems to follow from the postulate of relativity which is an integral part of the theory P; hence he did not resolve the paradox.[887]

In other words, because Einstein cannot extricate himself from either A or B he must choose which of the two will remain at rest so that he can judge the movement of the other. Without giving any reason for his choice, Einstein arbitrarily sides with B as his fulcrum, forgetting, apparently, that Relativity will simply not allow such biased choices, much less permit anyone to assume the vantage point of Aristotle's Unmoved Mover.

Probably Dingle's most succinct and easily comprehended criticism of Einstein's Special Relativity comes at the very beginning of his book:

> It would naturally be supposed that the point at issue…must still be too subtle and profound for the ordinary reader to be expected to understand it. On the contrary, it is of the most extreme simplicity. According to the theory, if you have two exactly similar clocks, A and B, and one is moving with respect to the other, they must work at different rates, *i.e.*, one works more slowly than the other. But the theory also requires that you cannot distinguish which clock is the 'moving' one; it is equally true to say that A rests while B moves and that B rests while A moves. The question therefore arises: how does one determine, consistently with the theory, which clock works the more slowly? Unless this question is answerable, the theory unavoidably requires that A works more slowly than B and B more slowly than A – which it requires no super-intelligence to see is impossible. Now, clearly, a theory that requires an impossibility cannot be true, and scientific integrity requires,

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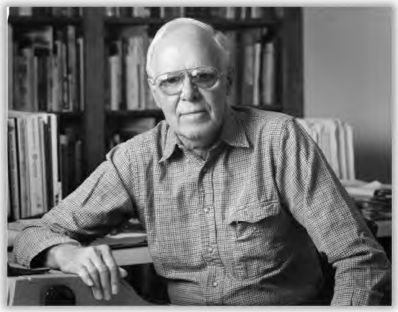
[887] *Science at the Crossroads*, pp. 185-186.

> therefore, either the question just posed shall be answered, or else that the theory shall be acknowledged to be false.[888]

Martin Gardner and the Inherent Flaws of Relativity

As we noted earlier, **Martin Gardner**, a popular writer for the technical magazine *Scientific American*, was a valiant supporter of Einstein, but he admitted that Dingle's critique of Einstein was "the strongest objection that can be made against the paradox."[889] At one point, perhaps without realizing precisely the implications of his statement, Gardner more or less confirms Dingle's objection. Replacing Dingle's "A" and "B" with a spaceship and Earth, respectively, Gardner says:



> Dingle's objection still remains, however, because exactly the same calculations can be made by supposing that the spaceship instead of the Earth is the fixed frame of reference. Now it is the Earth that moves away, shifts inertial frames, comes back again. Why wouldn't the same calculations, with the same equations, show that the Earth time slowed down the same way?[890]

As any honest Relativist would be compelled to do, Gardner was forced to admit that Relativity cannot distinguish between a fixed Earth in a rotating universe or a rotating Earth in a fixed universe:

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[888] *Science at the Crossroads*, p. 17.

[889] Martin Gardner, *The Relativity Explosion*, 1976, p. 133. This is the revised edition of *Relativity for the Million*, 1962, p. 120. Gardner then adds that only General Relativity could and must provide the answer to Dingle's objection (*Relativity Explosion*, p. 137; *Relativity…Million*, p. 122), without offering a suggestion how it possibly could do so. Gardner also admits that "Today, astronomers are skeptical of this confirmation. The difficulties in making precise measurements of star positions during an eclipse are much greater than Eddington supposed, and there have been differences in the results obtained during eclipses since 1919…and we haven't even considered the influence of unconscious bias on the part of astronomers who have preconceived ideas…" (*ibid*., pp. 113-114).

[890] *The Relativity Explosion*, p. 135; *Relativity for the Million*, p. 122.

> One could just as legitimately assume the Earth to be fixed and the entire universe, with its great spherical cloud of black-body radiation, to be moving. The equations are the same. Indeed, from the standpoint of relativity the choice of reference frame is arbitrary. Naturally, it is simpler to assume the universe is fixed and the Earth moving than the other way around, but the two ways of talking about the Earth's relative motion are two ways of saying the same thing…"[891]

This is precisely what happens when men reject divine revelation and depend upon themselves to answer the fundamental questions about things they simply cannot answer – it becomes a confusing hodgepodge of dualism and dichotomies in which man, literally, doesn't know whether he is coming or going. The corollary truth, of course, is that God assures us that He is not the author of confusion,[892] which leaves only two other possible sources, neither of which is very comforting.

Out of the blue, Gardner claims to have a way to distinguish between the two. He claims he can tell us which of Dingle's clocks, A or B, is running slower. The clock stationed on Earth, says Gardner, moves with the Earth, but "when the Earth moves away, *the entire universe moves with it*."[893] This is an astounding statement from Gardner, not because of its brilliance, but because of its implicit admission that, when the pressure mounts, Relativity depends upon a manufactured, hypothetical, non-Relativistic fixed point *outside* the universe to determine reality inside the universe! Yet if someone were to suggest to the Relativist that such a fixed point actually exists *inside* the universe, and that we even have experimental evidence to prove it (*e.g.*, Michelson-Morley, *et al*), he will dismiss this evidence as arbitrary, and choose, rather, to accept the absurdities of Relativity rather than admit the possibility of a fixed Earth.

Again, we see quite clearly that the very theory that was invented in 1905 to dispense with having to admit the possibility of an immobile Earth is the very theory that attempts to use immobility to escape geocentrism. Ironically, the hypothetical island that allows Gardner to peer inside the universe ends up supporting geocentrism, not heliocentrism. For if the

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[891] *The Relativity Explosion*, pp. 184-185. On another page Gardner writes: "Do the heavens revolve or does the Earth rotate? The question is meaningless. A waitress may just as sensibly ask a customer if he wanted ice cream on top of his pie or the pie placed under his ice cream" (*ibid*., p. 87).

[892] 1Cor. 14:33; Psalm 109:29; Isaiah 45:15-16.

[893] *The Relativity Explosion*, p. 135; *Relativity for the Million*, p. 122; (emphasis his). Paul Feyerabend referred to Martin Gardener as "the pitbull of Scientism" (*Against Method*, p. 122).

Earth, as he says, is moving step-for-step with the universe, then it is an immobile point within the universe, while the spaceship is sauntering away bit by bit. In effect, Gardner has tried to deny geocentrism by means of geocentrism. These are the contradictions inherent in Einstein's theory, but its adherents will continue to pretend such anomalies do not exist. In either case, they are trapped and geocentrism is vindicated.

Gardner attempts another means to solve this dilemma:

> What if the cosmos contained nothing except two spaceships, A and B? Ship A turns on its rocket engines, makes a long trip, comes back. Would the previously synchronized clocks on the two ships be the same? The answer depends on whether you adopt Eddington's view of inertia or the Machian view of Dennis Sciama. In Eddington's view the answer is "yes." Ship A accelerates with respect to the metric of space-time structure of the cosmos; ship B does not…From Sciama's point of view the answer is "no." Acceleration is meaningless except with respect to other material bodies…the two spaceships. In fact, there are no inertial frames to speak of, because there is no inertia (except an extremely feeble, negligible inertia resulting from the presence of the two ships).[894]

We see again Relativity's desire to have it both ways. It dismisses absolute space, ether, and anything else that would give substantive or inertial quality to the vast regions between the heavenly bodies, but it conveniently returns them to the scene in the form of "the metric space-time structure of the cosmos" in order to answer the difficult questions. Einstein, as we will see later in this volume, did much the same in his 1920 paper claiming that his Minkowski-Riemann metric served the same purpose as the ether of pre-Relativistic times. Sciama, as noted above, removed this little 'bit of magic' quite easily.

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[894] *Relativity for the Million*, p. 124. Sciama quotes Eddington's objection to Mach: "If the earth is non-rotating, the stars must be going round it with terrific speed [a fact that Gardener has already admitted]. May they not in virtue of their high velocities produce gravitationally a sensible field of force on the earth, which we recognize as the centrifugal force? This would be a genuine elimination of absolute rotation, attributing all effects indifferently to the rotation of the earth, the stars being at rest, or to the revolution of the stars, the earth being at rest; nothing matters except the relative rotation. I doubt whether anyone will persuade himself that the stars have anything to do with the phenomenon. We do not believe that if the heavenly bodies were all annihilated it would upset the gyrocompass. In any case, precise calculation shows that the centrifugal forces could not be produced by the motions of the stars, so far as they are known" (Dennis Sciama, *The Unity of the Universe*, 1961, p. 113).

The Dead Ends of Relativity for Modern Cosmology

Beyond the math, most physicists have begun to see the flaws in Einstein's theories on merely a practical level. They have been quietly burying his theories for the past few decades, but are somewhat reluctant to invite the public to the funeral for fear of demoralizing them, so it has been decided to let them die a slow but inevitable death by themselves. It was no less a scientific luminary than Stephen Hawking who revealed the awful truth:

> We already know that general relativity must be altered. By predicting points of infinite density – singularities – classical general relativity predicts its own down-fall….When a theory predicts singularities such as infinite density and curvature, it is a sign that the theory must somehow be modified.[895]

Einstein knew this as well. He struggled his whole life to produce singularity-free equations, but was never successful. Hawking continues:

> If general relativity is wrong, why have all experiments thus far supported it? The reason that we haven't yet noticed any discrepancy with observation is that all the gravitational fields that we normally experience are very weak.[896]

In reality, it is not only strong gravitational fields that demonstrate the erroneous tenets of General Relativity but, as we will see in the appendices of our treatise, even what Hawking understands as the so-called "experiments thus far supporting it," in reality, do not support Relativity theory at all. When examined very closely, they actually disprove it. We speak here mainly of Einstein's explanation for the perihelion of Mercury and the bending of starlight near the sun.[897]

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[895] *A Briefer History of Time*, 2005, pp. 102, 84; *Black Holes and Baby Universes*, 1994, p. 92. We should mention here that the ether-based universe of geocentrism does not produce blackholes – a decided advantage when the viability of various universes is being determined. Blackholes remain only a theoretical result of General Relativity, but there are no indisputable discoveries of blackholes. Stephen Crothers has done the most work on this issue. See http://www.youtube.com/watch?v=fsWKlNfQwJU

[896] *A Briefer History of Time*, p. 102.

Hence, it is not just singularities and blackholes that are the problem with Relativity. The whole theory has become suspect of being flawed. A *Discover* magazine issue commemorating the 100th anniversary of Einstein's 1905 Relativity theory put it even more candidly:

> Albert Einstein got it wrong. Not once, not twice, but countless times. He made subtle blunders, he made outright goofs, his oversights were glaring. Error infiltrated every aspect of his thinking. He was wrong about the universe, wrong about its contents, wrong about the inner workings of atoms…In 1911 Einstein predicted [by Relativity] how much the sun's gravity would deflect nearby starlight and got it wrong by half. He rigged the equations of general relativity to explain why the cosmos was standing still when it wasn't. Beginning in the mid-1920s, he churned out faulty unified field theories at a prodigious rate. American physicist Wolfgang Pauli complained that Einstein's 'tenacious energy guarantees us on the average one theory per annum,' each of which 'is usually considered by its author to be the "definitive solution."'[898]

As the popular and technical magazine *Scientific American* gently put the situation:

> Einstein has become such an icon that it sounds sacrilegious to suggest he was wrong…But if most laypeople are scandalized by claims that Einstein may have been wrong, most theoretical physicists would be much more startled if he had been right.[899]

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[897] See Volume II, "Einstein: Everything is Relative," "Do the 1919 Eclipse Photographs Prove General Relativity?"; "Does Mercury's Residual Perihelion Prove General Relativity?"; "Does the Hefele-Keating Experiment Prove General Relativity?"

[898] Karen Wright, *Discover* contributing editor, "The Master's Mistakes," September 2004, p. 50. Wright was apparently chosen to diffuse the Einstein mystique, since the other articles in the issue are mostly positive. She concludes: "Yet Einstein's mistakes could be compelling and instructive, and some were even essential to the progress of modern physics." Robert Kunzig, states: "It's just a matter of time, most physicists think, before Einstein fails. Relativity touches so much of physics that a violation could show up almost anywhere" (*ibid.*, p. 60).

[899] *Scientific American*, "Was Einstein Right?" by George Musser, September 2004, p. 88. Continuing, he writes: "…when the general theory of

In 1920, just after the famous eclipse photographs produced by Sir Arthur Eddington in 1919 (which purportedly showed at least one photograph of starlight bending near the sun at the angle Einstein predicted), Einstein's "curved space" became the major plank of modern cosmology. Overnight all of modern science was turned upside down. Einstein went so far as to claim that nothing in the universe can be absolutely straight. He asserted that a disc whirling at high speed would be shorter around its rim and thus upset the value of π and all the rest of Euclidean geometry. The impact of his theory was overwhelming. But in the mid-1920s, Willem de Sitter, who made a thorough use of Einstein's equations, demonstrated that his "curved" universe could not be proven. De Sitter consulted with Einstein and showed him the mathematical proofs. By 1932, Einstein and de Sitter co-wrote an article, which included the statement: "We must conclude that at the present time it is possible to represent the facts without assuming a curvature of three dimensional space."[900] The *Science News Letter* of April 2, 1932 stated:

> *Einstein and De Sitter Return to Euclidean Idea of Cosmos*: Prof. Albert Einstein, father of relativity, says that space may be and probably is the sort of uncurved, three-dimensional space that Euclid imagined and countless generations of schoolboys have learned…Prof. Willem de Sitter, Dutch astronomer, who had built his own shape of universe on Einsteinian foundations, joins with Prof. Einstein in espousing space which is on the average Euclidean….This joint announcement… is sure to cause a furor in the world of science.…In the Euclidean universe now re-enthroned, light travels in straight lines and goes on and on forever and ever.

Four years later, the famous astronomer Edwin Hubble wrote: "if redshifts are not primarily due to velocity shifts…there is no evidence of expansion, no trace of curvature, no restriction of the time scale."[901] Hubble's complaint is related to the issue we hear about so often today concerning "Dark Matter." The main reason the majority of modern scientists are still clinging so closely to the existence of Dark Matter and its cousin Dark Energy – to the tune of having it comprise a whopping

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relativity…meets quantum mechanics…it is relativity that must give way. Einstein's masterpiece, though not strictly 'wrong,' will ultimately be exposed as mere approximation."

[900] *Proceedings of the National Academy of Sciences*, Washington, 18, 1932, pp. 213-214.

[901] *Astrophysical Journal* 84, 517, 1936, p. 553.

95% of the known universe, even though no one has ever seen a trace of them – is that without them Einstein's field equations will not work. If Einstein's field equations are invalid, so is the Big Bang to which they gave birth. As one author says:

> Dark matter is needed if one assumes Einstein's field equations to be valid. However, there is no single observational hint at particles which could make up this dark matter. As a consequence, there are attempts to describe the same effects by a modification of the gravitational field equations, *e.g.* of Yukawa form, or by a modification of the dynamics of particles, like the MOND ansatz, recently formulated in a relativistic frame. Due to the lack of direct detection of Dark Matter particles, all those attempts are on the same footing.[902]

After Hubble, three years later, in 1939, Herbert Ives suggested that the bending of starlight near the sun is a result of the *slowing down* of light in gravitational fields, not because of a warping of space-time. As a beam of light passes the sun, the part of the beam that is nearer to the sun will be slowed more than the part of the beam further away. (Analogously, hair curls because one side of the shaft grows slower than the other). The sun acts the same as a lens, since lenses slow the speed of light, which we see as refraction.[903]

The problems continue for Relativity. Physicists who have put their whole careers behind Einstein's theory admit that it cannot be reconciled with the burgeoning field of Quantum Mechanics, which has been so successful at predicting the inner workings of nature.[904] In fact, not only is there no reconciliation for the two theories, they actually obliterate one another. Popular science writer/physicist Brian Greene adds:

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[902] C. Lämmerzahl, O. Preuss and H. Dittus, "Is the Physics within the Solar System Really Understood," ZARM, University of Bremen, Germany; Max Planck Institute for Solar System Research, Germany, April 12, 2006, p. 2.

[903] *Jour. of the Optical Society of Amer.*, 29:183-187, 1939.

[904] In comparing this contradiction to the heliocentric/geocentric debate, Feyerabend notes: "To use modern terms: astronomers are entirely safe when saying that a model has predictive advantages over another model, but they get into trouble when asserting that it is therefore a faithful image of reality. Or, more generally: the fact that a model works does not by itself show that reality is structured like the model….And now take the best theories of modern physics, general relativity in its most recent form and general quantum mechanics. So far it has proved impossible to merge them into a coherent whole – the one theory makes assertions which are flatly contradicted by the other….All these example have immediate application to the case of the Copernican theory whose coherence and partial success were also regarded as signs of a close correspondence to reality" (*Farewell to Reason*, p. 250).

> Bell's reasoning and Aspect's experiments show that the kind of universe Einstein envisioned may exist in the mind, but not in reality…we now see that the data rule out this kind of thinking; the data rule out this kind of universe.[905]

After spending over one thousand pages convincing their readers of the glories of General Relativity, Charles Misner, Kip Thorne and John Wheeler (some of the more authoritative names in modern physics), finally admit that:

> The uncertainty principle [of Quantum Mechanics] thus deprives one of any way whatsoever to predict, or even to give meaning to, "the deterministic classical history of space evolving in time." No prediction of spacetime, therefore no meaning for spacetime, is the verdict of the quantum principle. That object which is central to all of classical general relativity, the four-dimensional spacetime geometry, simply does not exist, except in a classical approximation.[906]

Long before these current scientists finally discovered the flaws in Einstein's system, his critics in earlier times were quite numerous. Herbert Dingle, at first one of the scientists chosen to write popular editions of the General Theory of Relativity in the 1920s, and whose supportive essay was included in Schlipp's 1949 compendium *Albert Einstein: Philosopher-Scientist*, eventually found serious anomalies in Relativity.[907] By the 1960s he became Einstein's most formidable critic. Siding with Einstein, *Nature*, the most prestigious science journal known then and today, simply refused to publish Dingle's critique, resorting instead to accusing him of "dishonesty" for his work. In Dingle's own words:

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[905] Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality*, 2004, pp. 120-121. For more information on the nature of Bell's Theorem and Aspect's experiments, see Chapter 7. NB: Although we quote Greene, we are not adopting String Theory.

[906] *Gravitation*, 1973, 25th print, pp. 1182-83. That two diametrically opposed theories (General Relativity and Quantum Mechanics) can both hold center stage in physics today, reveals like nothing else the shaky foundation upon which modern cosmology is built. On the one hand, Misner states that "the standard Big-Bang model of the universe [is] predicted by General Relativity," but admit "General Relativity is incapable of projecting backward through the singularity to say what 'preceded'" the Big Bang, "and, unfortunately, no problem is farther from solution," since General Relativity breaks down at that point (*ibid.*, p. 770).

[907] In Dingle's own words: "To the best of my knowledge there is no one now living who can give objective evidence that he is more competent in the subject than I am….I have been studying relativity for more than 50 years. I learnt it in the first place from the late professor A[lfred] N[orth] Whitehead, who

> "…one of the chief stumbling-blocks to the general reader, as I know from my wide correspondence, is the difficulty of believing that, if the theory [of Einstein] is so plainly wrong, it could have been believed by everyone for more than 50 years. The book [of Dingle's] explains the very peculiar historical circumstances that have brought this about. I think I can say without conceit that there is no one now living who has had so much experience as I of the whole course of development and had personal contact with practically all the pioneers of the subject, and so is able to give a credible explanation of the apparently incredible. That, notwithstanding its incredibility, the simple error in the theory is indeed a fact is shown by the

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encouraged me to write my first book on the subject (*Relativity for All* – Methuen). During the following half-century I have studied intensively the field of investigation to which it belongs, and discussed the theory with practically all those physicists whose names are best known in connection with it – Einstein, Eddington, Tolman, Whittaker, Schrödinger, Born, Bridgman, to name a few: I knew some of them intimately. I worked for a year (1932-3) with Tolman while he was writing his now standard work, *Relativity Thermodynamics and Cosmology* (Clarendon Press)….When in 1940, I published my second book on the subject (*The Special Theory of Relativity* – Methuen)…Max Born wrote me: 'I have enjoyed it very much, as your explanations of the difficult subject are very clear and well presented.'….Whittaker…published his history of the whole field of thought of which special relativity forms a part…I sent him some comments…to which he replied: 'Many thanks for the corrections and comments. You have detected several mistakes…and some of the remarks and suggestions you make could have originated only from a vast background of knowledge, which fills me with admiration.' When the volume on Einstein in *The Library of Living Philosophers* (published in 1949) was prepared, there were only two Englishmen among the twenty-five contributors selected from the world; I was one….When Einstein died I was summoned to broadcast a tribute to him on BBC television, which I did. Later, Granada television invited me to give a course on relativity, but by that time I was fairly well convinced that the special theory was untenable, so I refused. There are two articles on the subject in the *Encyclopedia Britannica*, one by an American and the other by me. It was written before I had reason to reject the special theory….I could continue in this vein, but it is distasteful and, moreover, I consider that the question should be decided on its intrinsic merits and not by a comparison of personal records" (Herbert Dingle, *Science at the Crossroads*, pp. 106-107).

> unbreakable silence of all the leading authorities (except McCrea and Lyttleton) on my criticism, and the failure of NATURE to keep its promise to comment (which could only be a climbdown)…"[908]
>
> "The absurdity which Mr. Stadlen reaffirms illustrates 'the present state of the scientific world': scientists have lost the power to believe that special relativity may be wrong….they resort to any absurdity to escape the inescapable. The change in 'the state of the scientific world' is that whereas, according to accepted tradition, in these circumstances the theory would at once be rejected, I have not found one of the 'authorities' with the courage either to make this choice or to admit his change of criterion for truth; the book records ample instances of my efforts and their futility. To take but one of its examples, a universally acknowledged authority on the theory, after a long correspondence, asked me if I was hoaxing, for 'I cannot bring myself to believe that you are as stupid as you make yourself out to be' – my stupidity lying in the fact that I subjected special relativity to criticism. Not only could one of the acutest minds in the business not see through the "hoax," he could not even decide it was a hoax, so he gave me up. That is the universal state of affairs, and it was to inform the unsuspecting public – and with a faint hope that the exposure might stab the "establishment" broad awake before anything disastrous happens…"[909]
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> "I am not so much interested in the scientific reviews – after all, there is nothing they can do but evade the point and misrepresent the book, as NATURE and NEW SCIENTIST have done…"[910]

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[908] Personal letter signed by Herbert Dingle written to Timothy O'Keeffe of Martin, Brian and O'Keeffe, Ltd, London, England, on March 20, 1972. Copy on file.

[909] Letter signed by Herbert Dingle to Timothy O'Keeffe, dated Oct. 14, 1972, emphasis in the original. "Mr. Stadlen" was hired by *The Listener* to review Dingle's book, *Science at the Crossroads*, which was eventually published by O'Keeffe. Copy on file.

[910] Personal letter signed by Herbert Dingle to Timothy O'Keeffe, dated October 26, 1972. Copy on file. Emphasis, including capitals and underlining, in the original.

> "A recent issue of NATURE contains a review [241, 143 (1973)], by Professor John Ziman, of my book, Science at the Crossroads…But Professor Ziman calls the book 'sincere, dishonest'. I do not understand how it can be both, but to the charge of dishonesty I cannot be indifferent. Not only does it defame my moral character, but also, since I have stated plainly that 'The primary and inescapable purpose of this book is to make known, to those with an indefeasible right to the knowledge, the present state of the scientific world as revealed by its practice, and to bring it into comparison with what is generally believed, and implicitly trusted, to be its state'…a conviction of dishonesty would entitle – indeed, compel – both actual and intending serious readers to dismiss my whole account as culpably untrustworthy. I must therefore ask Professor Ziman either to substantiate his charge or publicly, unambiguously and unreservedly to withdraw it."[911]

After some legal haggling, *Nature* eventually wrote an apology to Dingle that was published in its June 8, 1973, issue. *Science* also issued a similar apology on June 15, 1973.

Other well-known and accomplished physicists, many of them having received their own Nobel Prizes, rejected Einstein's Relativity theories in the early going, and more came on board as time progressed. Respected scientists such as Adler, Appell, Aspden, Assis, Barter, Beckmann, Bergson, Bouasse, Bragg, Brown, Brillouin, Callahan, Cauchy, Champeney, Cullwic, Darboux, Denisov, Dingle, Dingler, Dudley, Duport, Essen, Galeczki, Gehrcke, Graneau, Guillaume, Gut, Hatch, Heaviside, Henderson, Ives, Kantor, Kanarev, Kastler, Kraus, Lallemand, Larmour, LeCornu, Lenard, LeRoux, Levi-Civita, Lodge, Lorentz, Lovejoy, Lynch, Mach, MacMillan, Mackaye, Magie, McCausland, Michelson, Miller,

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[911] Personal unsigned letter from Herbert Dingle "To the Editor of NATURE," no date given. Copy on file. The only scientist of international repute to offer a critique of Dingle was Max Born. Born writes only the following words: "The simple fact that all relations between space co-ordinates and time expressed by the Lorentz transformations can be represented geometrically by Minkowski diagrams should suffice to show that there can be no logical contradiction in the theory." Dingle replied but there was no follow up from Born. Born's answer was hardly sufficient, since as Dr. Ian McCausland stated: "Since the Lorentz transformation is contained in the special theory, but is not the whole theory, it is illogical to claim that any property of the Lorentz transformation is a sufficient condition for the whole theory to be free of logical contradiction" ("The Twins Paradox of Relativity," *Wireless World*, July 1981).

Mohorovičić, Montague, Moon, More, Moulton, Nordenson, O'Rahilly, Painlevé, Phipps, Picard, Planck, Poincaré, Poor, Radakov, Ricci, Rutherford, Sagnac, Seeliger, Selleri, Soddy, Stark, Theimer, Turner, van der Kamp, van der Waals, Weinmann, Weyland, et al., discovered the same anomalies, and many of them wrote major critiques against Einstein between the 1920s and 1960s. Even Leopold Infeld, although authoring a book with Einstein in 1938 titled *The Evolution of Physics*, ten years later, when applying Einstein's formulas to the structure of the universe, writes: "Einstein's original ideas, as viewed from the perspective of our present day, are antiquated if not even wrong."[912]

If these evidences fail to give pause, then perhaps a few statements from Einstein himself at the end of his career will help put things in proper perspective. Whether he meant it as an omen or an obituary, nevertheless, Einstein was apparently feeling the depression of over half a century of doubt about his theories when, on his seventieth birthday he remarked in a March 28, 1949 letter to his old friend Maurice Solovine:

> You imagine that I regard my life's work with calm satisfaction. But a close look yields a completely different picture. I am not convinced of the certainty of a simple [single] concept, and I am uncertain as to whether I was both a heretic and reactionary who has, so to speak, survived himself.[913]

These thoughts were brewing in Einstein's mind for a few years. In a letter to J. Lee in 1945 he wrote:

> A scientific person will never understand why he should believe opinions only because they are written in a certain book. Furthermore, he will never believe that the results of his own attempts are final.[914]

In 1948 Einstein wrote the following words in the Foreword to a popular book on Relativity:

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[912] Leopold Infeld, "On the Structure of the Universe," in *Albert Einstein: Philosopher-Scientist*, p. 477.

[913] *Letters to Solovine*, translated by Wade Baskin from the French *Lettres à Maurice Solovine*, 1987, p. 111. Einstein's wording in the original German of the sentence "Da ist kein einzeiger Begriff…" more likely refers to "not a single concept," since *einzeiger* is closer to the meaning of "one" or "single," whereas *einfach* would be the more common word for "simple." In the same set of letters Einstein reveals his doubts about General Relativity.

[914] Alice Calaprice, *The Expanded Quotable Einstein*, p. 14.

> Moreover, the present state of our knowledge in physics is aptly characterized. The author shows how the growth of our factual knowledge, together with the striving for a unified theoretical conception comprising all empirical data, has led to the present situation which is characterized – notwithstanding all successes – by an uncertainty concerning the choice of the basic theoretical concepts.[915]

Here we see in Einstein an introspection that he rarely revealed to his physics colleagues, many who were in intense competition with him. But they are rather disheartening words from a man who turned the world upside down with his highfalutin theories. In locating his target of derision as "the basic theoretical concepts," Einstein is casting doubt on the whole enterprise of modern physics, admitting that his and other theories may, in fact, be totally mistaken regarding how the universe operates.

Einstein's intimate thoughts were revealed only to the best of his personal friends, the people who really knew the man behind the persona. To them Einstein's negative assessment of his life's work was not merely an exercise in self-deprecation. This is noted by yet another revealing comment Einstein made to Michel Besso, his closest confidant, in a 1954 letter:

> I consider it quite possible that physics cannot be based on the field concept, *i.e.*, continuous structures. In that case, *nothing* remains of my entire castle in the air, gravitation theory included, [and of] the rest of modern physics.[916]

Two months before his death, he admitted that he could not make the mathematics of his theory of gravitation work correctly. To Solovine he writes:

> I have finally managed to introduce another noteworthy improvement into the theory of the gravitational field (theory of the nonsymmetrical field). But not even these simplified

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[915] Lincoln Barnett, *The Universe and Dr. Einstein*, revised edition, 1950, p. 10.

[916] Abraham Pais, *Subtle is the Lord: The Science and the Life of Albert Einstein*, 1982, 2005, p. 467. Pais argues Einstein's self-assessment was "unreasonably harsh," which shows Pais knows how damaging the quote is to Einsein's reputation. Still, Pais admits to other such sentiments from Einstein, such as the letter to Born in 1940: "Our respective hobby-horses have irretrievably run off in different directions….Even I cannot adhere to [mine] with absolute confidence" (*ibid*.).

> equations can be verified by the facts as yet because of mathematical difficulties. Warmest greetings to you and your wife. Your[s], A. Einstein.[917]

After remarking about "…the odd arguments which Ptolemy advances against Aristarchus' opinion that the world rotates and even moves around the sun," Einstein ironically admits to Solovine in the same November 25, 1948, letter:

> In my scientific activity, I am always hampered by the same mathematical difficulties, which make it impossible for me to confirm or refute my general relativist field theory.

As we noted previously, the mathematics Einstein employed to help bolster his Relativity theory is the same mathematics that shows geocentrism as a viable alternative to heliocentrism, therefore Einstein could never be sure which one was the correct model. Like many, he ignored the implications of his own theory and decided to "leave this question for the time being and accept Copernicus' point of view."[918]

The Case of the -meson

We see the same sleight-of-hand behind more recent claims that purport to have proven Special Relativity, in this case the activity of the μ-meson or the π-meson. As the story goes, μ-mesons or π-mesons appear when protons from cosmic rays enter the Earth's atmosphere and collide with its molecules. The mesons travel with great speed, but since they are inherently unstable, they will decay before they hit the Earth's surface. Yet many are found near the surface. How can this happen? Relativity's answer is: since moving clocks run slower, there is a time dilation from the point of view of the ground-based observer as he looks at the meson. From his vantage point, the lifetime of the meson is expanded by the Lorentzian factor and thus many of the mesons will reach the surface.[919]

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[917] *Letters to Solovine*, trans., by Wade Baskin from the French *Lettres à Maurice Solovine*, 1987, pp. 159, written Feb. 27, 1955, Einstein's death coming on April 18, 1955.

[918] Albert Einstein and Leopold Infeld, *The Evolution of Physics*, 1966, pp. 154-155.

[919] The Lorentz factor being $\surd(1 - v^2/c^2)$. Max Born, for example, regards the particles as π-mesons with a lifetime of about 2×10^{-8} seconds. In order to reach the Earth's surface from a height of 30 km, a speed of $0.999999995c$ is needed. To show the arbitrariness of the claims, Eric Chaisson believes the particles are

The problem with this explanation, of course, is that identical to the "A or B" paradox Dingle demonstrated, the principle of *role reversal* in Special Relativity will not allow its attempt to secure a preferred frame of reference, namely, the ground-based observer. Relativity purports that time is slowed for the ground-based observer but not the meson-based observer, but this would only be the case if it could somehow be proven that the ground or Earth was immobile, and thus the privileged frame, but it certainly cannot. Again, Relativity, by what appears to be a sort of shell game with the audience, appeals to the principle of a fixed Earth in order to support a relative universe. This paradox demonstrates the hopeless quagmire into which Relativity theory is forced. To speak of "moving clocks slowing down" really means nothing of significance since Relativity neither has a means to prove the object against which the clock is supposedly moving, nor does it have a standard clock from which to judge the time of the moving clock.

Interestingly enough, in the article "The 'Time Dilation' of Mesons Re-Examined," D. T. MacRoberts turns the tables and shows the geocentric results of the meson experiments:

> The high-velocity experiments on mesons such as those at CERN, are definite evidence of the mesons' lifetimes functional relationship to their velocity with respect to the Earth, but have nothing whatsoever to do with the "time dilation" of Special Relativity. The experiments also are yet another "ether-drift" investigation with the usual answer: *the velocity of the Earth with respect to a fundamental frame is zero*.[920]

Accordingly, it appears that Einstein himself recognized the critique before Dingle spelled it out for us so simply, but Einstein merely stated the problem without following it to its logical conclusion since, obviously, it would have nullified his whole Relativity theory. He writes:

> We see thus that we cannot attribute any absolute meaning to the concept of simultaneity. Rather, two events which, considered from one system of reference, are simultaneous, can, considered

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muons with a lifetime of 2×10^{-6} seconds. But this causes problems since, if the muons travel at 0.994*c*, their lifetime is extended by a factor of 9, which gives a lifetime of 18×10^{-6} seconds at 0.994*c* or 2.98×10^{5}m, thus allowing them to travel only 5.5km, not the needed 30km.

[920] D. T. MacRoberts, *Galilean Electrodynamics*, Sept/Oct 1992, p. 83, emphasis added.

> from a system moving in relation to the former, not be considered as simultaneous.[921]

This admission by Einstein leads us to conclude that his system of variants and constants is, ironically, completely "relative." On the one hand, if, due to the Michelson-Morley experiment, one assumes that the Earth is moving and light's speed always appears the same to all observers, even if some observers are moving, then one will be forced to say that lengths contract and time dilates. There is no other choice. On the other hand, since the solution is "relative," one could opt to keep lengths and time constant but change the speed of light. Mathematically speaking, the two solutions are precisely equivalent. In this case, the "relative" nature of Relativity comes back to haunt it. The other solution, of course, is to hold that the Earth is not moving, and the necessity of having to contort light, length or time evaporates. As Van der Kamp rightly concludes:

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[921] "Zur Elektrodynamik bewegter Körper" ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, 17, Sept. 26, 1905, p. 897. Einstein was more or less forced to his conclusions about time dilation due to his "principle of equivalence," which holds that there is no net difference between gravitational force and acceleration, and thus both effects will produce the same results. Hence, if clocks slow down in a gravitational field [as is commonly accepted in modern science based on such experiments by Pound and Rebka who used the Mössbauer effect to measure a frequency shift $(f'/f - 1) = (2.57 \quad 0.20) \times 10^{-15}$ after dropping photons a distance of 22.6 meters (*Physical Review Letters* 4, 337, 1960); or by Vessot, *et al*, who launched a hydrogen maser vertically at 8.5 km/sec, and verified its frequency change as it reached an altitude of 10,000 km, wherein the frequency shift due to gravity was $(f'/f - 1) = 4 \times 10^{-10}$ at the 10,000 km altitude (*Physical Review Letters* 45, 2081, 1980], the clocks must also slow down when accelerated. The relation between gravitation and acceleration was never proven, just assumed. It was also never proven that the slowing of a clock (*e.g.*, the difference in time kept by a terrestrial atomic clock as opposed to a high-altitude atomic clock; or a high-altitude clock traveling east, as in the Hefele-Keating experiment) is due, as Relativity theory holds, to gravity's distortion of the time-space continuum. Since modern science does not know the cause of gravity, it is futile to base co-equivalence on a factor whose nature is unknown. In fact, under alternative theories of gravity, a more viable explanation of the slowed clock is that it is a local mechanical affect caused either by the higher intensity of gravity and/or the higher density of the spatial medium (*e.g.*, ether) near the surface of the Earth as opposed to high-altitudes. See *Pushing Gravity: New Perspectives on Le Sage's Theory of Gravitation*, ed. Matthew R. Edwards, 2002. Assis adds: "It can be equally argued that these experiments only show that the half-lives of the unstable mesons depend on their accelerations and high velocities relative to the distant matter in the cosmos, or on the strong electromagnetic fields to which they were subject" (*Relational Mechanics*, p. 132). In any case, absolute time does not slow. Only the *measured* frequency slows.

> Not yet in the least verified, *ad hocs* fail to qualify as arguments, let alone as 'proofs.' They are by themselves only woolly excuses. Worse: until logically incontrovertible test results in their favour will have come to the fore, the skeletons of Ptolemy, Aristotle and Tycho Brahe still rattle happily in their cupboards.[922]

Einstein Admits Speed of Light is Not Constant

Since modern science has not matured enough to accept Brahe's option, we are left with the confusion seen in Einstein's prior quote concerning simultaneity being "possible and yet not possible." Thus it should not be surprising to learn what he once stated about the non-constancy of the speed of light – comments hidden in the file of inconvenient facts by the scientists who have sworn allegiance to the cult of Einstein. Already in June 1912 Einstein was probing the issue in a letter to one of his associates, Heinrich Zangger, stating: "What do the colleagues say about giving up the principle of the constancy of the velocity of light?"[923] Arthur Lynch reveals in his 1932 book, *The Case Against Einstein*, Einstein, just four years later, admitted that his theory of the constancy of light *in vacuo* had to be "modified." Below, Lynch is quoting Einstein, and gives a brief footnote (which I put in parentheses):

> Einstein continues: "In a similar manner we see 'unmittelbar' [immediately] that the principle of the constancy of the velocity of light in a vacuum must be modified. For one easily recognizes that the path of a beam of light, relative to K', must generally be

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[922] *De Labore Solis*, p. 39.

[923] Abraham Pais, *Subtle is the Lord*, p. 211. Pais attributes the comment merely to Einstein's resolve to preserve his views on "the redshift and the bending of light," but this cannot be the case. In reality, as Pais cites Einstein's prior sentence in the letter: "The generalization appears to be very difficult," it refers back to the May 1912 letter of Einstein's to Zangger which stated: "The further development of the theory of gravitation meets with great obstacles." Here Einstein is referring to his development of the General Theory of Relativity which he understands will require a modification to the constancy of the speed of light, since the c postulate of the Special Theory only applies in the absence of gravitational fields. Hence, if c must be modified to make room for the General Theory, we can understand why Einstein inquired if his colleagues would be willing to "give up" its constancy.

> crooked, when the light, with respect to K, moves in a straight line with definite constant velocity." (What Einstein sees here as 'unmittelbar,' he failed to see during the many years when he was insisting on his dogma of the constancy of the velocity of light). The word 'unmittelbar' amused me so much that I have taken care to give it in the original German….The whole paragraph is interesting because it goes on to deal with one of the profound discoveries of Relativity, that the velocity of light in reference to a body is the same whether that body be at rest, or in motion towards the source of light!…I notice for the moment that Einstein, having postulated the constancy of light, is content to "modify" it when his own reasoning leads him to contradiction; but he does not touch the previous mode of thought that led him to decree this constancy.[924]

Although Lynch doesn't footnote the quote from Einstein, it comes from Einstein's submission to *Annalen der Physik* in 1916.[925] E. J. Post adds that the "modification" was not well received from Einstein's colleagues:

> At the end of section 2 of his article on the foundations of the general theory, Einstein writes: "The principle of the constancy of the vacuum speed of light requires a modification." At the time, Max Abraham took Einstein to task (in a rather unfriendly manner) about this deviation from his earlier stance.[926]

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[924] *The Case Against Einstein*, Arthur Lynch, pp. 209-210. See also Stephen Hawking's citation of this quote in *A Stubborn Persistent Illusion*, 2007, p. 49. In another place, Lynch writes: "To thinkers who have confused time and space and regarded them as of the same category, if not interchangeable, anything is feasible; but the consequences of this transcendental thinking are more remarkable than they have supposed. For velocity is composed of relations between time and space, and since, as they claim, one may be expressed in terms of the other it may be taken as composed of time or, alternatively, of space. But velocity and mass are interchangeable, therefore mass may be composed of time, or alternatively, of space. If mass be expressible by time alone, it acquires a fleeting character which seems to allow the material world to dissolve under our feet; but if it be expressible by space alone our situation is worse, for space, according to the Relativists, has no *point de repère* [registering point or datum point]; it is so empty that we cannot seize upon any *point de repère* to measure the velocity of light or to fix its position; it is void, absolutely, what we call void; and so therefore is mass!" (*ibid*., p. 140).

[925] *Annalen der Physik*, 49, 769 (1916).

[926] E. J. Post, *Physics Today*, 35 (6), 11 (1982).

Similar to Lynch, in the 1940-50s, Hebert Ives wrote extensively on the "self-contradictory" nature of Einstein's principle of the constancy of the speed of light.[927] Even some of today's popular Relativists admit that the speed of light is not always constant *in vacuo*, and they go through the most strained semantic contortions in order to deny it is happening. As always, mathematics comes to the rescue. Clifford Will explains:

> The speed of light is indeed the same in every freely falling frame, but we are forced to consider a sequence of such frames all along the light path, and when we do so, we find that the observer at the end of the path determines that the light took longer to cover a given trajectory when it passed near the Sun than it would have had it passed farther from the Sun. Whether or not the observer used the words "light slows down near the Sun" is purely a question of semantics. Because he never goes near the Sun to make the measurement, he can't really make such a judgment; and if he had made such a measurement in a freely falling laboratory near the Sun, he would have found the same value for the speed of light as in a freely falling laboratory far from the Sun, and might have thoroughly confused himself. All the observer can say with no fear of contradiction is that he observed a time delay that depended on how close the light ray came to the Sun. The only sense in which it can be said that the light slowed down is mathematical: in a particular mathematical representation of the equations that describe the motion of the light ray, what general relativists call a particular coordinate system, the light appears to have a variable speed. But in a different mathematical representation (a different coordinate system), this statement might be false.[928]

Concerning a similar perspective on light, Charles Lane Poor reveals that Relativity's postulates

> indicate that light travels with different speeds in different directions, that the velocity of light depends upon the direction of transmission. That such a mathematical result represents the facts of nature is highly improbable, for in free space there is no

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[927] *Proceedings of the American Philosophical Society* 95: 125-131, 1951; *Journal of the Optical Society of America* 38: 879-884, 1948; 27: 263-273, 1937.

[928] Clifford Will, *Was Einstein Right*? pp. 112-113. Will goes on for six more pages using charts, diagrams and more math to convince the reader that his above paragraph actually makes sense.

> difference between right and left, between north and south, or east and west; there is no reason why a ray of light should travel faster to the north than to the south. To overcome this mathematical difficulty, or inconvenience, as he calls it, the relativist makes a substitution, or approximation. Instead of using the direct distance between the centers of two particles of matter, the relativist adds a small, a very small, factor to this distance; or, as Eddington puts it, "we shall slightly alter our coordinates." Such an approximation is very common among physicists: it is done every day to simplify troublesome formulas. The only precaution necessary in such a procedure is to remember always that the final result is necessarily approximate, and, before drawing any conclusion, to thoroughly test the effects of the approximation.[929]

Physicist Bryan Wallace reveals that when he discovered that the NASA Jet Propulsion Laboratory was basing their analysis of signal transit time in the solar system on the Newtonian and Galilean concept of $c + v$ (*i.e.*, the speed of light plus the speed of the source or medium of light) and not c as required by Einstein's theory, he was summarily censured by the editors of *Physics Today*. His July 9, 1984 letter to the magazine states:

> During a current literature search, I requested and received a reprint of a paper published by Theodore D. Moyer [*Celestial Mechanics* 23, 33 (1981)] of the Jet Propulsion Laboratory….The paper's (A6) equation and the accompanying information that calls for evaluating the position vectors at the signal reception time is nearly equivalent to the Galilean $c + v$ equation (2) in my paper "Radar Testing of the Relative Velocity of Light in Space" [B. G. Wallace, *Spectroscopy Letters*, 2, 361 (1969)]….The fact that the radio astronomers have been reluctant to acknowledge the full theoretical implications of their

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[929] Charles Lane Poor, "Relativity: An Approximation," Paper presented to the American Astronomical Society, Thirteenth Meeting, 1923, Mount Wilson Observatory, California, p. 3. Later Poor states: "But the method is faulty and contains obvious errors, and the fundamental formula for the velocity of light, upon which the entire method is based, is in direct contradiction to the principle of equivalence, for it shows that the speed of light *decreases* as it approaches the sun, while the equivalence principle demands that such velocity should increase" (*ibid.*, p. 12). For Poor's complete paper, which makes a detailed critique of Einstein's prediction of the perihelion of Mercury and the bending of starlight near the sun, see Volume II, "Einstein: Everything is Relative."

> work is probably related to the unfortunate things that tend to happen to physicists that are rash enough to challenge Einstein's sacred postulate [B. G. Wallace, *Physics Today*, 36, (1), 11 (1983)]. Over twenty-three years have gone by since the original Venus radar experiments clearly showed that the speed of light in space was not constant, and still the average scientist is not aware of this fact! This demonstrates why it is important for the APS [Astrophysical Society] to bring true scientific freedom to the PR [*Physical Review*] journal's editorial policy [B. G. Wallace, *Physics Today*, 37 (6), 15 (1984)].[930]

How would the non-constancy of the speed of light affect Relativity theory? Marilyn vos Savant tells us: "If the speed of light were discovered not to be constant, modern scientific theory would be devastated."[931] But according to one of Einstein's letters to Paul Ehrenfest, it wouldn't do any damage. He writes: "I certainly knew that the principle of the constancy of the velocity of light is something quite independent of the relativity postulate."[932] We can only say that it is amazing to watch the contortions through which Einstein puts his own theory.

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[930] B. G. Wallace, "Publication Politics" in *The Farce of Physics*, 1994. Wallace received a reply from *Physics Today* on Jan. 4, 1985 from Gloria B. Lubkin, acting editor, stating that the magazine editors reviewed the letter and decided against publication. Later, he received two more rejections. Moyer's paper is titled: "Transformation from Proper Time on Earth to Coordinate Time in Solar System Barycentric Space-Time Frame of Reference." His abstract states: "In order to obtain accurate computed values of Earth-based range and Doppler observables of a deep space probe, an expression is required for the time difference $t - \tau$, where t is coordinate time in the solar system barycentric space-time frame of reference and τ is proper time recorded on a fixed atomic clock on Earth…" (p. 33). The "A6 equation" in Moyer's paper is $R = r_{12}/c + \psi_{12} + r_{23}/c + \psi_{23} - (ET - TAI)_{t3} + (ET - TAI)_{t1} + \Delta$. Moyer writes: "The sum of the first four terms is the round-trip light time in ET [ephemeris time]…The next two terms convert this interval to an interval of TAI [International Atomic Time] (p. 47).

[931] Marilyn vos Savant holds the Guinness world record for the highest IQ, presently at 228 (although some tests put it at 186). Her above response was in answer to the question: "What one discovery or event would prove all or most of modern scientific theory wrong?" posed by a Jennifer W. Webster in *Parade* magazine in May 22, 1988. Ms. Savant offered another reason: "And if a divine creation could be proved to have occurred, modern scientists would be devastated."

[932] Einstein to Ehrenfest, June 3, 1912, Doc. 404, 409, in Papers, vol. 5, cited in "Einstein's Investigations of Galilean Covariant Electrodynamics Prior to 1905," John D. Norton, University of Pittsburgh, Dept. of History and Philosophy of

Einstein Reinterprets Maxwell in Favor of Relativity

All the foregoing aside, Einstein reveals another primary motivator that caused him to invent his Special Relativity theory. It appears in

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Science, Jan. 28, 2004, p. 24. Norton goes on to show how Wilhem de Sitter debunked Einstein's hypothesis requiring the need for light's constancy in order to produce shadows; and the fallacy of Einstein's claim that there were no differential equations to account for the "many velocities" of light (pp. 25-27). Dingle critiques de Sitter's "proof" of the constancy of light (and which Einstein cites in his co-authored book *The Evolution of Physics* in 1938) as determined by binary stars. He writes: "The point to be decided, then, is said to be whether the two beams of light emitted towards the Earth by the components at an instant when one is approaching and the other receding from the Earth with velocity v, travel to the Earth with the single velocity c, or with velocities $c + v$ and $c - v$, respectively." Einstein's second postulate argues that unless the light traveled at a constant velocity of c then "an Earthbound observer would therefore see a hopeless confusion of light form the two components, bearing no resemblance at all to the orderly revolution that would actually be taking place." Dingle concludes:

> This is, I think, the most remarkable example in the history of science of the wish fathering the thought – with the possible exception of the 'proofs,' following the Copernican heresy, that it was the Sun, and not the Earth, that moved, to which, in fact, this argument bears some resemblance. A finite velocity, of course (and it is not disputed that light in *vacuo* has a finite velocity) must be measured with respect to some standard, and if we do not accept…that the standard is empty space…the only alternative with any claim to consideration is that the velocity c is maintained with respect to the emitting body. But all that de Sitter's arguments disprove is that the velocity is maintained constant with respect to the Earth, for it is with respect to the Earth that the velocities $c + v$ and $c - v$ are reckoned, and surely no one in his senses would now maintain that the Earth provided a standard of rest for all the light in the universe…these observations tell us precisely nothing to enable us to choose between Einstein's postulate…and the postulate that light keeps a constant velocity with respect to its own source (which was proposed in 1908 by Ritz as an alternative to the Maxwell-Lorentz view, but he died before de Sitter's argument was conceived). How could such a simple fact have escaped notice for half a century? It was pointed out several years ago, and universally ignored – which is to me inexplicable on any other grounds than the universal inability of present-day physical scientists to believe that any criticism of special relativity that they cannot answer can proceed from anything but misunderstanding, which entitles them to ignore it (pp. 205-207).

various places, but particularly in a December 19, 1952 letter that Einstein wrote to Shankland:

> The influence of the crucial Michelson-Morley experiment upon my own efforts has been rather indirect. I learned of it through H. A. Lorentz's decisive investigation of the electrodynamics of moving bodies (1895) with which I was acquainted before developing the Special Theory of Relativity. Lorentz's basic assumptions on an ether at rest seemed to me not convincing in itself and also for the reason that it was leading to an interpretation of the result of the Michelson-Morley experiment which seemed to me artificial. What led me more or less directly to the Special Theory of Relativity was the conviction that the electromotive force acting on a body in motion in a magnetic field was nothing else but an electric field. But I was also guided by the result of the Fizeau experiment and the phenomenon of aberration.[933]

So, if the chief motivator for Einstein to invent Relativity theory was the anomaly he saw between electromagnetism and mechanical motion, perhaps the following quote can be interpreted such that the Michelson-Morley experiment cemented in Einstein's mind the issues raised by the Fizeau and Airy experiments on the one hand, and James Clerk Maxwell's theory of electromagnetism on the other:

> It is no doubt that Michelson's experiment was of considerable influence upon my work insofar as it strengthened my conviction concerning the validity of the principle of the Special Theory of Relativity.[934]

For Einstein there was an intimate connection between the laws of electrodynamics and the Michelson-Morley type experiments. He made this connection in his famous 1905 paper:

> Examples of this sort [anomalies in electro-magnetic correspondence] together with the unsuccessful attempts to discover any motion of the Earth relative to the 'light medium,' suggests that the phenomena of electrodynamics as well as of

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[933] R. S. Shankland, *Conversations with Albert Einstein*, p. 48, cited in Holton, p. 303, with Holton's interpolations omitted.

[934] Interview, March 17, 1942, with Albert Michelson's biographer (*Einstein: The Life and Times*, p. 128).

> mechanics possess no properties corresponding to the idea of absolute rest.[935]

Rather than deduce from these "unsuccessful attempts" that the Earth was motionless, Einstein was forced, by the prevailing scientific consensus to the only other conclusion – there was no "absolute rest," and this became the fundamental postulate of Relativity theory. If there were no absolute rest for macro-objects (such as Earth), Einstein hypothesized, at least in mathematical terms, there would be none in the micro-world (*e.g.*, electricity and magnetism). In the very first sentence of his 1905 paper Einstein writes:

> It is known that Maxwell's equations of electrodynamics – as usually understood at the present time – when applied to moving bodies, leads to asymmetries which do not appear to be inherent in the phenomena.[936]

In other words, although Maxwell's equations are different from one another, the actual phenomenon they represent is the same. In particular, Einstein is referring to the fact that Maxwell created one equation for finding the electromotive force produced in a conductor moving past a stationary magnet, but another equation for a magnet moving past a stationary conductor, even though both movements produced precisely the same current, a fact already known since the experiments of Faraday in 1831.[937]

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[935] Zur Electrodynamik Bewegter Körper ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, Vol. 17, 1905, p. 37. Also cited in *On the Shoulders of Giants* by Stephen Hawking, 2002, p. 1167.

[936] Zur Electrodynamik Bewegter Körper ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, Vol. 17, 1905, p. 1. As Herbert Dingle describes it: "…the whole of Einstein's special theory, as set out in his paper of 1905…treats of the relations between observable things in different 'coordinate systems'; *i.e.*, apart from trivial differences, it deals with the values which those things take when the observable physical system under consideration is regarded as having different states of uniform motion. It is a problem that had been considered for centuries and regarded as solved until an ambiguity arose when it was found that the relations accepted with the events treated in mechanics were incompatible with those which seemed to be demanded with the events treated in electromagnetism. Einstein's theory was designed to provide a relation that held for both kinds of events." (*Science at the Crossroads*, p. 137). See also L. P. Fominskiy in "The Concept of an Interval: A Basic Mistake of the Theory of Relativity" (*Spacetime and Substance*, Vol. 3, 2002, No. 2, 12, pp. 49-54). Holton remarks that Einstein's use of "asymmetries" seems out of place, at least until we consider the philosophical ramification of its meaning.

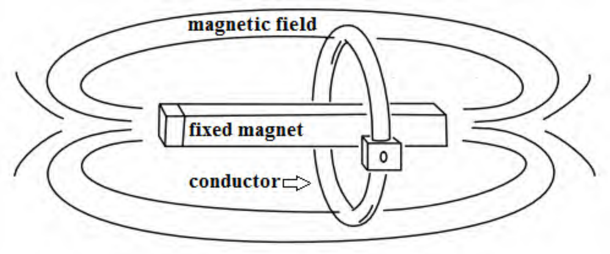

Fig. 1: stationary magnet produces no electic field; only a magnetic field

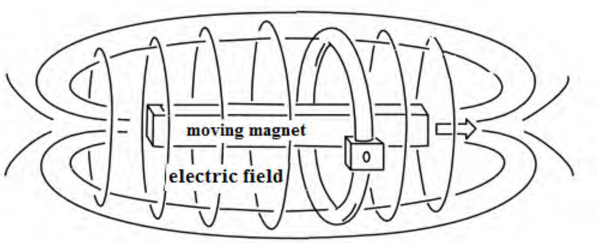

Fig. 2: magnet moving through conductor creates electric field around magnet

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[937] Maxwell had four equations: (1) $\delta E = 4\pi\rho$ (2) $\delta \quad = 0$ (3) $\delta \quad = 4\pi j/c + 1/c\ \delta E/\delta t$ (4) $\delta E = -1/c\ \delta \quad /\delta t$. is the magnetic field; *j* is the current flux; ρ is the charge density; E is the electric field. The two equations of interest here are (3) and (4), since they give different equations for finding the change in the magnetic field (equation 3) as opposed to the change in the electrical field (equation 4). Maxwell believed that ether was a material substance with elasticity, made up of vortices and what he called "idle wheels." Electricity and magnetism were created by a deformation of the vortices and the wheels. By the continual process of deformation and rotation of the wheels, electromagnetism could then be expressed by the four above equations.

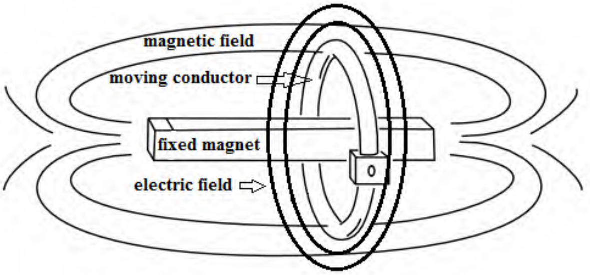

Fig 3: conductor moving over fixed magnet creates electric field around conductor

As Einstein puts it:

> Take, for example, the reciprocal electrodynamic action of a magnet and a conductor (see Fig. 1). The observable phenomenon here depends only on the relative motion of the conductor and the magnet, whereas the customary view draws a sharp distinction between the two cases in which either the one or the other of these bodies is in motion. For if the magnet is in motion and the conductor at rest (see Fig. 2), there arises in the neighborhood of the magnet an electric field with a certain definite energy, producing a current at the places where parts of the conductor are situated. But if the magnet is stationary and the conductor in motion (see Fig. 3), no electric field arises in the neighborhood of the magnet. In the conductor, however, we find an electromotive force, to which in itself there is no corresponding energy, but which gives rise – assuming the equality of the relative motion in the two cases discussed – of electric currents of the same path and intensity as those produced by the electric form in the former case.[938]

The conventional way of explaining this phenomenon was the following: if the conductor is moving toward a fixed magnet, the electrical charge in the conductor is pulled around the conductor by the force of the magnetic field. Conversely, if the magnet is moving toward the conductor, the increasing magnetic field produces an electric field that drives the charge around the conductor. Einstein apparently did not like this explanation. The reason is noted in the parenthetical statement he adds toward the end of the above paragraph: "…assuming the equality of the relative motion in the two cases discussed…" If the "relative motion" is the same in both cases (that is, a conductor moving toward a stationary magnet or a magnet moving toward a stationary conductor are identical), Einstein assumed that the results should be identical, that is, in both cases the current produced should either always be around the magnet or always around the conductor, and not switch between the magnet and the conductor. Since the results were not identical, Einstein sought to find a reason, but he would do so assuming the principle of Relativity.[939]

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[938] "Zur Electrodynamik Bewegter Körper" ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, Vol. 17, 1905, p. 1.

Before we move on to discover how Einstein attempted to solve this problem, we can pause to point out that the relationship between the magnet and the conductor is analogous to the situation in Machian cosmology (and a cosmology with which Einstein agreed) wherein a rotating Earth in a stationary universe appears to be the same as a stationary Earth in a rotating universe. Since between the conductor and the magnet there seems to be a preferred place the electric current seeks depending on whether the conductor or the magnet is moving against the other, we would likewise say that there is also a preferred cosmology between the Earth and the universe, that is, of the two Machian cosmologies (a fixed Earth and rotating universe or a fixed universe and a rotating Earth) it would seem correct to postulate that the principles of the relation between electricity and magnetism discovered by Maxwell (and/or the principle between gravity and inertia), will reveal which of the two cosmologies is correct. After all, Einstein himself extrapolated principles from the results of the small-scale electromotive model and transferred them to the large-scale cosmological model since, by his own admission, this is precisely the connection he saw between Maxwell's equations and the Michelson-Morley experiment.[940]

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[939] The electromagnetic field in Relativity is not merely two separate vectors (electricity and magnetism) but as components of a 4-dimensional tensor, such that a change in velocity is represented by the 4-dimensional rotation of the tensor. In any case, we would do well to pause here and remind ourselves that the difficulty that both Maxwell and Einstein faced was that neither of them knew the nature of the physical reality. They merely explained the results by mathematical equations. As mathematician Morris Kline states: "What is especially remarkable about electromagnetic waves…is that we have not the slightest physical knowledge of what electromagnetic waves are. Only mathematics vouches for their existence…The same observation applies to all sorts of atomic and nuclear phenomena. Mathematicians and theoretical physicists speak of fields – the gravitational field, the electromagnetic field, the field of electrons, and others – as though they were material waves which spread out into space and exert their effects somewhat as water waves pound against ships and shores. But these fields are fictions. We know nothing of their physical nature" (Morris Kline, *Mathematics: The Loss of Certainty*, p. 337).

Seeking support for Relativity and having a vested interest in denying the Earth as the immovable frame of reference, Einstein sought to explain both the Maxwell and the Michelson-Morley phenomena purely from a Relativistic standpoint so that it would make no difference whether the magnet or the conductor is at rest, or whether the Earth or the universe is at rest. Although a viable solution to contradictions created when kinematics and electromagnetism are mixed is a fixed Earth, Einstein did not want to accept that solution. Instead, he insisted there should be no absolute rest. In essence, this is the principal reason Einstein sought to eliminate the ether, since, as Maxwell's equations and Michelson-Morley's experiment dictated, ether will help us to choose which frame of reference is correct. The evidence, freely admitted but "ruled out" by Einstein, showed that the preferred frame of reference was a fixed Earth.

This solution is also admitted, in a roundabout way, by standard physics textbooks. As one text says:

> However, it appeared that Maxwell's equations did not satisfy the relativity principle. They were not the same in all inertial reference frames…Thus, although most of the laws of physics obeyed the relativity principle, the laws of electricity and magnetism…apparently did not. Instead, they *seemed to single out one reference frame that was better than any other – a reference frame that could be considered to be absolutely at rest.*[941]

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[940] As quoted above: "the unsuccessful attempts to discover any motion of the Earth relative to the 'light medium,' suggests that the phenomena of electrodynamics as well as of mechanics possess no properties corresponding to the idea of absolute rest."

[941] Douglas C. Giancoli, *Physics: Principles with Applications*, first edition, 1980, p. 621; fifth edition, 1998, p. 795, emphasis added. Giancoli adds: "The question then arose: In what reference frame does light have precisely the value that is predicted by Maxwell's theory? For it was assumed that light, like other objects, would have a different speed in different frames of reference. For example, if an observer were traveling on a rocket ship at a speed of 1.0×10^8 m/s toward a source of light, we might expect that he would measure the speed of the light reaching him to be 3.0×10^8 m/s + 1.0×10^8 = 4.0×10^8 m/s. But Maxwell's equations have no provision for relative velocity. They merely predicted the speed of light to be $c = 3.0 \times 10^8$ m/s. This seemed to imply that there must be a special reference frame where c could have this value" (*ibid*).

Another text adds:

> "A more formal way of saying this is as follows: Maxwell's equations of electro-magnetism…contain the constant $c = 1/\surd(\mu_o\varepsilon_o)$ which is identified as the velocity of propagation of a plane wave in vacuum….But such a velocity cannot be the same for observers in different inertial frames, according to the Galilean transformations, so Maxwell's equations and therefore electromagnetic effects will probably not be the same for different inertial observers. But if we accept both the Galilean transformations and Maxwell's equations as basically correct, *then it automatically follows that there exists a unique privileged frame of reference*…in which Maxwell's equations are valid and in which light is propagated at a speed $c = 1/\surd(\mu_o\varepsilon_o)$."[942]

Einstein certainly had his problems to solve. If he was not going to accept a fixed Earth or ether, he then had to figure out how to deal with the two Maxwell equations that contained the speed of light. As noted above, the equations did not allow the speed to change (although Maxwell did not specify a vector to the electromagnetic field, rather, he merely said the field moved with respect to the ether). He also had to solve the paradox of Maxwell's equations with the Galilean understanding of space (also known as Galilean Relativity), which holds that if a stationary person observes a moving object then a second person who is in motion will observe a different velocity for the same object. In regard to the velocity of light, this means that the source's velocity or the observer's velocity will add to or subtract from the velocity of light. Maxwell's equations, however, state that each person will see the same velocity. Although no observed phenomena violated either Galilean or Maxwellian space, the theoretical contradiction between the two was apparent. It seemed there was one set of velocity rules for mechanics, and another set for electrodynamics.[943]

The first attempt to solve this problem was to postulate that Maxwell's equations are true only with respect to the ether, not the observer. Since waves need a medium to propagate (*e.g.*, sound waves, water waves), ether was the natural solution.[944] From Maxwell's perspective, the ether will react differently with a moving magnet than it will with a fixed magnet, but it will adjust for the discrepancy by producing the same electric current. This takes into account that magnetism is velocity dependent, and thus directionally dependent within its absolute frame, the ether. Magnetism has no relationship to relative velocities. As such, magnetism has been the death knell for every cosmological perspective that failed to see the Earth as immobile, including Galilean relativity, Newtonian relativity and Einsteinian relativity.[945]

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[942] Robert Resnick and David Halliday, *Basic Concepts in Relativity and Early Quantum Theory*, 1985, p. 12, emphasis added.

[943] Equations 3 and 4 contain *c* in the denominator, which remains constant: (3) $\delta\quad = 4\pi j/c + 1/c\ \delta E/\delta t$ (4) $\delta E = -1/c\ \delta\quad/\delta t$.

[944] That Maxwell was a firm believer in the ether medium is noted in the following quote from him: "The interplanetary and interstellar spaces are not empty, but are

Still, Einstein did not like the "asymmetry" presented by the two different Maxwellian equations, even though they produced the same current. As he did to explain the results of the Michelson-Morley experiment, Einstein's solution to Maxwell's equations was to eliminate both the ether and absolute motion (the absolute motion of the magnetic field in the ether). This allows one to "relativize" the components so that one equation can be used for both cases. He makes this very suggestion in one of the last sentences of the Introduction to his 1905 paper:

> The introduction of a "luminiferous ether" will prove to be superfluous inasmuch as the view here to be developed will not require an "absolutely stationary space" provided with special properties, nor assign a velocity-vector to a point of the empty space in which the electromagnetic processes take place.[946]

In another place he writes:

> In setting up the Special Theory of Relativity, the following…idea concerning Faraday's magnet-electric induction played a guiding role for me….The idea, however, that these were two, in principle, different cases was unbearable for me. The difference between the two, I was convinced, could only be

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occupied by a material substance or body, which is certainly the largest, and probably the most uniform body of which we have any knowledge" (*Scientific Papers of James Clerk Maxwell*, 1965, "Ether," p. 775).

[945] Magnetism, as opposed to gravity and electricity, is velocity dependent [E = v]. The force of magnetism is: $F = q_1 q_2 v_2 \times (v_1 \times r)/r^2$, where q = the electric charge.

[946] Zur Electrodynamik Bewegter Körper ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, Vol. 17, (1905, p. 2, as cited in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, 1952, p. 38).

> a difference in choice of viewpoint and not a real difference. Judged from the [moving] magnet, there was certainly no electric field present. Judged from the [ether] there certainly was one present. Thus the existence of the electric field was a relative one, according to the state of motion of the coordinate system used, and only the electric and magnetic field together could be ascribed a kind of objective reality, apart from the state of motion of the observer of the coordinate system. The phenomenon of magneto-electric induction compelled me to postulate the principle of relativity….The difficulty to be overcome lay in the constancy of the velocity of light in a vacuum, which I first believed had to be given up. Only after years of groping did I notice that the difficulty lay in the arbitrariness of basic kinematical concepts.[947]

We must understand the bind in which Einstein found himself: (a) the Michelson-Morley experiment has provided him with evidence that the Earth is not moving through ether; and (b) the property of magnetism requires that magnetism be understood as a velocity-vector phenomenon, but neither (a) nor (b) are "relativistic" events. Since Einstein believes a moving Earth is already proven, he must find a radical solution that will allow him to dispense with a motionless Earth and the vector-dependent state of magnetism. Einstein's solution, of course, is to do away with "absolute rest" altogether. Hence, there would be no fixed Earth, no fixed universe, no fixed magnet and no fixed conductor. All are in relative motion and there is no fixed frame of reference. It was the only way out of the dilemma. As Dingle recounts it in terms of his famous Cheshire cat:

> …this was a direct contradiction of Maxwell's basic axiom…What Einstein was proposing, therefore, was to retain the finite velocity of light without the existence of any standard with respect to which that velocity had a meaning. Light consisted of waves, with a definite length, frequency and velocity, in nothing; it was the grin without the Cheshire cat….the fact that it could have been proposed at all is inexplicable until we remember the nature of the acceptance…so well expressed by Hertz – 'Maxwell's theory is Maxwell's system of equations.' The physical part of the theory was

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[947] "Fundamental Ideas and Methods of the theory of Relativity, Presented in Their Development," Collected Papers of Albert Einstein, Vol. 7, Doc. 31, as cited in John D. Norton's paper "Einstein's Investigations of Galilean Covariant Electrodynamics prior to 1905," p. 5.

> expendable; only the equations needed to be saved. Einstein saw a way of saving the equations, and did not consider it worthwhile to 'explain' light…If his assumptions were granted he did save the equations, and when his theory ultimately made its general impact on the world, mathematics had so dominated physics that the non-existence of the Cheshire cat was regarded as a triviality; the grin remained, and all was well.[948]

So here was another case in which mathematics distorted the empirical evidence. As long as a temporary solution could be proffered by an equation, science would accept it and hope to figure out the actual physics sometime later (but never did). Einstein's math allowed him to relativize all the physical components and thus he turned the separate components of electricity and magnetism into "electromagnetism"; he turned the separate components of space and time into "space-time"; and he would then turn the components of acceleration and gravity into the one phenomenon of the "inertio-gravitational field," all by means of mathematical equations of which even he himself admitted that he didn't know whether they represented reality.[949]

"Spacetime's" originator was Hermann Minkowski:

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[948] *Science at the Crossroads*, pp. 155-156. Norton tries to explain the issue by noting that "if the magnet and conductor move together an extra complication enters. Because the conductor is now moving absolutely in a magnetic field, another part of Maxwell's theory tells us that a second electric current will be induced in the conductor. Remarkably that second current flows in the opposite direction to the one produced by the electric field and it turns out to cancel it out exactly. The upshot is that checking for an electric current in the conductor fails as a means of distinguishing the absolute rest of the magnet in motion…it is as if the electric field just isn't there for an observer moving with the magnet. But one at rest in the ether would say there is an electric field present" (Einstein's Pathway to Special Relativity," pp. 4-5). This is a special pleading that has no merit, since moving the magnet with the conductor is clearly a different case; and no claims of "moving absolutely" or "as if it isn't there" applications can be made. It is fallacious to deny the significance of two opposing currents simply by an appeal to an observer who has no senses to distinguish them. Norton's explanation is just another case that Relativity seeks to answer anomalies by making everything dependent on what the observer sees, not by what the reality dictates.

[949] One of Einstein's more famous quotes is: "As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality" (*Sidelights on Relativity*, Dover Publications, 1983, p. 28). Other quotes along these same lines are: "Do not worry about your problems with mathematics, I assure you mine are far greater"; "Mathematics are well and good but nature keeps dragging us around by the nose."

> The views of space and time which I wish to lay before you have sprung from the soil of experimental physics and therein lies their strength. They are radical. Henceforth space by itself and time by itself are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality.[950]

Hermann Minkowski
(1864 – 1909)

Indeed, they were "radical." So radical that they didn't make a bit of sense. Not even the mathematics could be called upon to make it work. As he did with Einstein's theory, Charles Lane Poor shows the fallacies of the Minkowski math:

> Let us turn for a moment to some tenets that preceded the Einstein Theory of Relativity and led up to it. First comes the gloomy forecast of Minkowski that 'From henceforth [1908] space in itself and time in itself sink to mere shadows and only a kind of union of the two remains independent.' The layman is puzzled to know just what this sinking of space and time into mere shadows means, as also just what the union product is, and

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[950] From Minkowski's September 21, 1908 "Raum and Zeit" ("Space and Time") lecture in Cologne to the 80th Assembly of German Natural Scientists and Physicians, cited in *The Principle of Relativity*: *A Collection of Original Memoirs on the Special and General Theory of Relativity* by H. A. Lorentz, A. Einstein, H. Minkowski and H. Weyl, translated by W. Perrett and G. B. Jeffery from the original 1923 edition, 1952, p. 75.

> why the union has independence when its constituents have none.[951]

After instructing the reader on the Pythagorean theorem concerning the length of the hypotenuse (D) of right triangle, such that $D^2 = x^2 + y^2$ or $D = \sqrt{(x^2 + y^2)}$, Poor expands to $D = \sqrt{(x^2 + y^2 + z^2)}$ to show how the same principle applies to three dimensions. He writes:

> This equation, therefore, represents a definite, fundamental relation between the coordinates of point in ordinary space: the distance [D] is the same, no matter upon what system the individual measures are made. In the terms of the mathematician, D is *invariant*. Now Minkowski showed that, when the Lorentz transformation equations are used, there is a similar *invariant* quantity connecting the four coordinates necessary to locate an event in space and time. This quantity is $D' = \sqrt{(x^2 + y^2 + z^2 - c^2t^2)}$ where c is the velocity of light and t, the interval of time between two events, and x, y, z, the ordinary three distance coordinates. Now Minkowski showed that, no matter in what direction the measures are made, no matter what system of coordinates be used, then D' always has the same value; it is *invariant*, absolute, and thus furnishes a definite and fixed relation between the space coordinates and the time coordinate…. This mathematical expression of Minkowski for a space-time interval corresponds closely to our ordinary expression for the distance between two objects, but not exactly. The term involving the time is preceded by a minus sign instead of a plus sign. The correspondence, however, can be made complete, if the time coordinate, ct, is replaced by the imaginary quantity $ct \times \sqrt{-1}$. This is a mathematical symbol for an imaginary quantity, for something we can neither visualize, nor conceive of. It is useless to attempt to illustrate or visualize the connection between time and space; the very mathematical symbol used to denote the form of the connection indicates the impossibility of our doing so. Thus the very mathematical symbol, used by the followers of relativity, indicates the purely imaginary character of all their reasoning. From these postulates and principles Einstein has built up his entire theory of relativity.[952]

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[951] *Gravitation versus Relativity*, p. xviii.

[952] *Gravitation versus Relativity*, pp. 40-44.

"If Michelson-Morley is wrong, then Relativity is wrong."
Albert Einstein[953]

"No amount of experimentation can ever prove me right; a single experiment can prove me wrong." Albert Einstein[954]

"I am really more of a philosopher than a physicist."
Albert Einstein[955]

"...by the reading of David Hume's and Ernst Mach's philosophical writings....It is very well possible that without these philosophical studies I would not have arrived at the special theory of relativity."
Albert Einstein[956]

"General Relativity has passed every solar-system test with flying colors. Yet so have alternative theories." Clifford Will[957]

"Apropos of your characterization of Einstein, I think of him as the great paradox swallower; e.g., the velocity of light is independent of the velocity of the source, and also shares the velocity of the source; light is waves and also is particles. His technique for solving a problem is always to say that both of two contradictory explanations are true."
Herbert Ives[958]

"Thus, general relativity brings about its own downfall by predicting singularities."
Stephen Hawking[959]

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[953] Einstein's words to Sir Herbert Samuel on the grounds of Government House, Jerusalem, Israel, cited in *Einstein: The Life and Times*, p. 107.

[954] Cited in Alice Calaprice's, *The Expanded Quotable Einstein*, p. 315.

[955] Einstein's words to Leopold Infeld, *Quest – An Autobiography*, p. 258.

[956] Letter to Carl Seelig, as cited in *Albert Einstein—A Documentary Bibliography*, p. 67, cited in Max Jammer's *Einstein and Religion*, pp. 40-41.

[957] Clifford Will, "The Confrontation Between Gravitation Theory and Experiment," *General Relativity: An Einstein Centenary Survey*, ed., Stephen W. Hawking, 1979, p. 62.

[958] Letter from Herbert Ives to Butterfield, March 19, 1953, cited in *The Einstein Myth and the Ives Papers*, eds. Dean Turner and Richard Hazelett, p. 219.

[959] *Black Holes and Baby Universes*, p. 92.

Chapter 5

More Experiments Point to Geocentrism

There has been much debate about whether the Michelson-Morley experiment was correctly interpreted. The 1887 experiment found fringe shifts that corresponded to about a 5 km/sec speed of ether against the Earth, but since Michelson and Morley assumed the Earth was already moving at 30 km/sec around the sun, they reasoned the experiment should have shown fringe shifting equating to a speed of at least 30 km/sec. Since the results were a mere fraction of that value, they interpreted them as "null" and concluded there was no appreciable ether movement against the Earth and no impedance of the light beams in their experiment. Please note here that, based on their presupposition of a moving Earth (which had not been proven, only assumed) they confidently made their conclusions. Obviously, if the Earth were not moving, Michelson and Morley's conclusions would be totally erroneous. As we noted earlier from Whitrow:

> It is both amusing and instructive to speculate on what might have happened if such an experiment could have been performed in the sixteenth or seventeenth centuries when men were debating the rival merits of the Copernican and Ptolemaic systems. The result would surely have been interpreted as conclusive evidence for the immobility of the Earth, and therefore as a triumphant vindication of the Ptolemaic system and irrefutable falsification of the Copernican hypothesis. The moral of this historical fantasy is that it is often dangerous to believe in the absolute verification or falsification of a scientific hypothesis. All judgments of this type are necessarily made in some historical context which may be drastically modified by the changing perspective of human knowledge.[960]

The 5 km/sec shows that at least *something* was present for which they had to give an explanation, for vacuums in space do not give such resistances.[961] In addition, since this *something* is moving at a rate much less than 30 km/sec, they must explain how this entity could cause such noticeable effects upon *all* subsequent interferometer experiments if the Earth was not moving through it. As physicist Héctor Múnera observes: "…what then is the origin of the small amplitude (hence, small laboratory velocity) observed by Michelson-Morley?....This is the remaining puzzle in the whole story."[962] It would have been much easier for them if the experiment had registered zero km/sec instead of five, since the former figure would have easily allowed them to claim that ether did not exist. In fact, Einstein's whole theory of Relativity is based on the supposition that there is *nothing* in outer space, and thus the theory requires that there be an interferometer result with absolutely no fringe shifting corresponding to a speed of zero km/sec. If the Earth doesn't move and yet there is any fringe reading above zero, no matter how small, this should immediately nullify Relativity theory.

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[960] G. J. Whitrow, *The Structure and Evolution of the Universe*, 1949, 1959, p. 79.

[961] We pause to note that 5 km/sec is a rough average accumulated by the interferometer experiments. We use 5 because it correlates to Michelson's statement that the speed was "one sixth" of 30 km/sec. This value fluctuates

What we will find in virtually all of the interferometer experiments is this: the experimenters took advantage of the fact that since 5 km/sec was much closer to zero km/sec than it was to 30 km/sec, this difference was used to justify eliminating a material ether for their new cosmological concepts. Consequently, each time an interferometer experiment was performed subsequent to 1887, the experimenters would give the same interpretation that Michelson and Morley gave, *i.e.*, no appreciable ether movement against the Earth. Nobody paid any attention to, or didn't know what to do with, the single-digit movement of the ether found in all the experiments, since, obviously, they were all convinced that the Earth was moving through space and that its 30 km/sec speed around the sun made

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depending on the latitude and altitude of the apparatus, as it should in principle. Apparatus closer to the equator should register higher speeds, whereas those at the poles should register near zero. Similarly, lower altitudes should register slower speeds.

[962] Héctor Múnera, "The Evidence for Length Contraction at the Turn of the 20th Century: Non-existent," in *Einstein and Poincaré: The Physical Vacuum*, p. 89. Múnera, being a heliocentrist, still believes that "the earth moves with a net velocity V equal to the vector addition of V_s and V_0, the orbital velocity of earth around the sun." Seeking for a non-relativistic solution to the anomaly, he thus looks for "what changes, if any, would the design of the Michelson-Morley experiment require?" and answers it by postulating that Michelson-Morley's "expectations" need to be "recalculated for the net V," implying that Michelson and Morley did not calibrate their findings correctly (*ibid*., p. 95). Later he adds: "Hence, all Michelson-Morley-type experiments up to 1930 that used the same incorrect data gathering process were bound to obtain apparent earth speeds that were too low" (*ibid*., p. 100). Suffice it to say that it is highly unlikely that "all" the inferometer experiments could be wrong, since they were all capable of measuring even the minutest deviations in light's speed.

the 5 km/sec fringe shifts totally insignificant. Lorentz, for example, attempted to attribute the 5 km/sec to experimental errors, stating: “If we make the necessary correction, we arrive at displacements no greater than might be masked by errors of observation.”[963] The same kind of objections are voiced today. But here is the reality: if something substantive constitutes space and is causing the consistent single-digit readings, then there is no “error of observation.” As **Charles Lane Poor** stated:

> The Michelson-Morley experiment forms the basis of the relativity theory: Einstein calls it decisive…if it should develop that there is a measurable ether-drift, then the entire fabric of the relativity theory would collapse like a house of cards.[964]

Scientific experiments are all a matter of interpretation and perspective. If the scientist comes to the experiment with various presuppositions and prejudices that are not true, this will turn even the most accurate experiment into an exercise in futility. We have already cited Arthur Eddington’s admission: “There are no purely observational facts about the heavenly bodies…it is only by theory that they are translated into knowledge of a universe outside.” The Michelson-Morley experiment brought this truth out better than any other, since its results were so devastating to science. As Clark reveals:

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[963] “Michelson’s Interference Experiment,” H. A. Lorentz, cited in *The Principle of Relativity*, 1952, p. 4.

[964] *Gravitation versus Relativity*, p. 261.

> It [Michelson-Morley] suggested, furthermore, that the best path to be followed might not be that of observation followed by the induction of general laws, but the totally different process of postulating a theory and then discovering whether or not the facts fitted it. Thus a theory should start with more scientific and philosophical assumptions than the facts alone warranted. A decade later the method was to provide the startling results of the General Theory.[965]

Blinded by the unproven premise of heliocentrism, scientists would resort to all kinds of twisted and *ad hoc* explanations of the factual data and make up extravagant new theories as they went along, concocting bizarre concepts that brought common sense, and even personal sanity, to the brink of destruction. It was as if a pandemic disease had spread across the landscape, and hardly any scientist would escape its grip. Science was now working by this simple syllogism:

Major Premise: It is self-evident the Earth moves.
Minor Premise: No interferometer has ever measured such movement.
The Conclusion: Earth moves, matter shrinks, time dilates, and neither ether nor absolute motion exist. Everything is relative. Case closed.

We see this even among some of Einstein's critics. Max von Laue, who had critiqued the use of $E = mc^2$ by noting that Einstein arbitrarily eliminated kinetic energy, was still sold on the idea of Relativity and, like Einstein, never gave a thought to a fixed-Earth to explain the perplexing results from various experiments. For example, in reference to the Trouton-Noble experiment, which attempted to show that electrically charged plates would assume a position of least resistance caused by the Earth's movement, von Laue writes:

> Thus it appeared reasonable that an electrically charged condenser… would assume a particular orientation relative to the velocity of the Earth, the one in which the angular momentum vanishes. This conclusion is inescapable in Newtonian mechanics. However, in 1903 Fr. T. Noble and H. R. Trouton searched for this effect in vain, and even the more accurate repetition of their experiment by R. Tomaschek (1925-26)

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[965] *Einstein: The Life and Times*, pp. 126-127.

> showed no trace of the effect. Their result is just as convincing a proof of the principle of relativity as Michelson's interference experiment. Both of these experiments proved the necessity for a new mechanics; Michelson's experiment because it showed the contraction of moving bodies in the direction of motion, and the experiment of Trouton and Noble because it showed that an angular momentum does not necessarily lead to a rotation of the body involved…. Thus, a new epoch in physics created a new mechanics…it began, we might say, with the question as to what effect the motion of the Earth has on physical processes which take place on the Earth…we can assign to the dividing line between epochs a precise date: It was on September 26, 1905, that Albert Einstein's investigation entitled "On the Electrodynamics of Bodies in Motion" appeared in the *Annalen der Physik*.[966]

One might think that if the plates showed "no trace of the effect" that a reasonable conclusion would be that there was no angular momentum from a moving Earth against which they had to orient themselves. But having accepted Copernicanism as gospel, von Laue is led to the incredible conclusion that "angular momentum does not necessarily lead to a rotation of the body involved." Rather than question Copernicanism, von Laue would rather modify one of the most sacrosanct principles of physics, and one that had never heretofore been disproved by anyone – the law of angular momentum. Here we see that an intelligent man will not save himself and the science of physics a degree of self-respect by perhaps considering that a possible reason Trouton-Noble's results were negative was that the Earth was motionless, thus showing quite clearly how presuppositions hold ultimate sway over reasonable conclusions.

Accordingly, when Relativistic scientists consistently saw the 5 km/sec results of virtually all the interferometer experiments, we invariably see the following conclusion written in their textbooks: "These results are consistent with the Special Theory of Relativity." Thus everyone thinks that the theory has been verified countless times. But the only thing that has been verified is that Relativists continue to think the Earth is moving without any physical proof that it is actually doing so. Moreover, since Special Relativity was invented to compensate for the fact that the interferometer and other experiments were showing that the Earth wasn't moving (or, either it or the ether was moving at 5 km/sec instead of the required 30+ km/sec), happily, but presumptuously, they concluded that each subsequent experiment which showed a 5 km/sec result (or thereabouts) would invariably be interpreted as "consistent with the Special Theory of Relativity." In short, this became a vicious circle of self-attestation. The sad fact is there seems to be no escape from this viciousness, unless, of course, there comes about the same overhaul of physics to the same degree that Special Relativity foisted itself upon the world in 1905. Returning to a motionless Earth in the center of the universe is just such an overhaul. We will examine this more in later chapters. For now, we will trace the history of the interferometer experiments subsequent to the writing of Einstein's 1905 paper that reported the same "null" results as those done prior to 1905.

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[966] *Albert Einstein: Philosopher-Scientist*, pp. 522-523.

Interferometer Experiments Subsequent to 1905

In 1926 Roy Kennedy performed an experiment, placing an interferometer in a pressurized metallic chamber at a high altitude but it yielded what he interpreted as "null" results, and in 1932 he wrote a paper with Edward Thorndike on those results.[967] In 1926 the experiment by A.

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[967] R. J. Kennedy at the Conference on the Michelson-Morley Experiment held at Mount Wilson Observatory, Feb. 4-5, 1927, in *The Astrophysical Journal* 68, 1928, 367-373; R. J. Kennedy, "A Refinement of the Michelson-Morley experiment," Proc. National Academy of Science, 12, 621-629, 1926; R. J. Kennedy and E. M. Thorndike, *Experimental Establishment of the Relativity of Time*, *Physical Review* 42, 1932, 400-418. They used an interferometer similar to Michelson's but with different arm lengths and none at right angles to the others. They also kept the apparatus at 0.001 degree Celsius, as well as using photographs of the fringes for calibration. Kennedy and Thorndike are quite transparent, however, in their bias towards Relativity, stating: "With the apparatus finally employed, we have shown that there is no effect corresponding to absolute time unless the velocity of the solar system in space is no more than about half that of the Earth in its orbit. Using this null result and that of the Michelson-Morley experiment we derive the Lorentz-Einstein transformations, which are tantamount to the relativity principle….there can be little doubt that the experiment yields a strictly null result." Perhaps Kennedy's choice of language, "there can be little doubt" betrays the fact to the keen observer that, unless their result was zero, then at least a "little doubt" exists as to whether there, was, in fact, a completely null result. In actuality, Kennedy and Thorndike did not find a "null" result, but one which showed a resistance (*i.e.*, the ether moving against the Earth) at "10 10 km per sec," which in terms of these kinds of experiments, is not "scarce" at all. So how did they justify interpreting this as a "null" result? They did so by comparing their results against the hypothesized speed of receding nebulae: "In view of relative velocities amounting to thousands of kilometers per second known to exist among the nebulae, this can scarcely be regarded as other than a

Piccard and E. Stahel at Mt. Rigni also produced what they understood as a "null" result.[968] In 1927, K. K. Illingworth improved the sensitivity of

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clear null result; it is of the same order of precision as that of the Michelson-Morley experiment." Múnera adds: "since Kennedy was looking for shifts produced by 90° rotations from a reference position, equation $D_A = 2A\cos 2\,\&_N$ tells that, if RA points north, the expected shift tends to zero when $\cos 2\ \&_N \approx 0$, *i.e.*, when $\&_N$ is close to being a multiple of 45°. For September 16 at Pasadena this occurs four times during the day, around 02:30, 08:50, 17:05 and 18:30 local apparent time….Kennedy says that 'the experiment was performed….at various times of day, but oftenest at the time when Miller's conclusions require the greatest effect' which for 'the middle two weeks of September, when the present work was done corresponds to local solar times varying from 6:30 A.M. to 5:30 A.M' (Kennedy, p. 628). This time period seems to be midway between 02:30 and 08:50, but Kennedy does not explicitly state the *initial* orientation of his interferometer, so that we cannot draw any definite conclusions" (Héctor Múnera, "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, and Compatibility with Absolute Space," *Apeiron*, Vol. 5, Nr. 1-2, January-April 1998, p. 46).

[968] Lynch writes: "…a series of experiments of Professor Piccard of Brussels which at first failed to show, even at the summit of the Rigi, at over six thousand feet of altitude, an ether wind of more than one and a half kilometers a second. Experiments by balloon gave a very different result, the ether wind at eight thousand feet being nine kilometers a second" (*The Case Against Einstein*, p. 45). Galaev reports that the results were 7 km/sec and that the team concluded that "We cannot discuss Miller's result on the basis of this experimental series, as our measurement's accuracy is just on the border of Miller's observations" ("Ethereal Wind in Experience of Millimetric Radiowave Propagation," *The Institute of Radiophysics and Electronics of NSA in Ukraine*, Aug. 26, 2001, p. 213). Galaev's observation will become more meaningful when we address Miller's results. Analyzing Piccard's data, Múnera writes: "From 96 turns of an interferometer in a balloon over Belgium they obtained a speed of 6.9 km/s with a probable error of 7 km/s. According to conventional statistical practice, the result simply means that at 50% confidence level the true speed is in the interval from 0 to 13.9 km/s. Moreover, there is no reason to believe that one particular value (say, 0 km/s, or 13 km/s) is more likely than another. Then, Piccard and Stahel result is completely consistent with those of Miller….They repeated the experiment in Brussels. Their results are (translating from the French) '60 turns of the apparatus produced an average displacement of 0.0002 ± 0.0007 fringes, which are incompatible with Miller's results.' Not so. Using equations $V = V_0 \sqrt{(|D| / D_R)} = C \sqrt{|D|}$ and $V_0 = V_I$ for $D = D_0$ for their equipment, we get 1.7 ± 3.1 km/s. Assuming that 3.1 km/s was a probable error (as in the balloon experiment), a one-tailed test says that [the] true speed was lower than 9.3 km/s at 95% C.L. Again, compatible with Miller's results. Brylinski long ago criticized the interpretation of Piccard and Stahel on similar grounds (E. Brylinski, "Sur la vitesse relative de la terre et de éther avoisinant," *Comptes Rendus* 184, 1927, 192-193). They unconvincingly

Kennedy's device but still produced a "null" result.[969] Although not an interferometer experiment, nevertheless, in 1927, Pieter Zeeman's work with the speed of light in different materials showed similar null results.[970]

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replied thus (our translation): 'all our measurements have given ether winds lower than the probable error of our measures, so that we cannot conclude in favor of Miller, as Brylinski does' (A. Piccard and E. Stahel, "Sur le vent d éther," *Comptes Rendus*, 184, 1927, 451-452….Piccard and Stahel repeated the experiment at Mt. Rigi in Switzerland. From 120 turns of the interferometer they found (translating from French): 'a sinusoidal curve whose amplitude is 40 times smaller than the curve that Miller would have predicted, all these within the limits of our probable errors….this curve corresponds to an ether wind of 1.45 km/s' ("L absence du vent d ether au Rigi," *Comptes Rendus*, 185, 1927, 1198-1200). Again, note [third systematic error]. Also, this is not a zero speed. Unfortunately, they did not report the probable error" (Héctor Múnera, "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, and Compatibility with Absolute Space," *Apeiron*, Vol. 5, Jan.-April 1998, p. 45).

[969] K. K. Illingworth, "A repetition of the Michelson-Morley experiment using Kennedy's refinement," *Physical Review*, 30, 692-696, 1926. Múnera writes: "…most papers exhibit an inconsistency between observation (a non-zero velocity) and interpretation (a null result). This paper is no exception….As usual in other papers, a high experimental resolution is suggested by quoting small fringe-shifts. However, Illingworth's Table I immediately tells us that the quoted sensitivity (1/1500 to 1/500 fringe-shift) is not that good: 3 to 5 km/s. This velocity resolution is from 10% to 17% of the velocity to be measured! (Not an excellent resolution as suggested by the experimenters)….As noted…for the Piccard and Stahel case, the standard interpretation of statistical errors is that the true ether velocity is within the error bounds at some specified C.L. For instance for session 1A at 11 a.m., the average velocity is 2.12 km/s, the true velocity being between 0.89 and 3.35 km/s at 50% C.L. Of course, for higher confidences the uncertainty band is wider. Similarly for the other seven sessions. Clearly, Illingworth's results were not null. However, Illingworth was not very certain as to what the interpretation should be, as exemplified by the following rather obscure paragraph from his conclusions: 'Since in over one half the cases the observed shift is less than the probable error the present work cannot be interpreted as indicating an ether drift to an accuracy of one kilometer per second' (page 696)" (Héctor Múnera, "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, and Compatibility with Absolute Space," *Apeiron*, Vol. 5, Nr. 1-2, January-April 1998, pp. 46-47).

[970] Jozef Wilczynski writes regarding Zeeman's experiments: "They are proper ones to find or test the speed V of the Earth's surface with respect to an ether. The results deny the existence of such a speed" (*Toth-Maatian Review*, November 1994, as cited in *The Biblical Astronomer*, Vol. 4, No. 67, 1994). Moreover, Zeeman's experiments are 'first order' in that they are designed to measure the Earth's speed divided by the speed of light, that is v/c, as opposed to 'second

In 1926-1929, Albert Michelson teamed up with F. G. Pease and F. Pearson and declared again that he produced a "null" result.[971] In 1930, Von Georg Joos conducted the final *optical* interferometer test and reported that he found the same "null" result.[972] After Joos, those

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order' experiments which measure v^2/c^2. Zeeman's experiment appears in *Arkhs. Nederl. Sci.* 10, pp. 131-220. See also "Zeeman Effect in Astrophysical Spectra," *Observatory*, No. 850, 69, June 1949, p. 110; "Solar Flares and Zeeman Effect," *Nature*, 164, August 1949, p. 280.

[971] A. A. Michelson, F. G. Pease and F. Pearson, "Repetition of the Michelson-Morley experiment," *Nature* 123, 1929, 88. Also printed in *Journal of the American Optical Society* 18, 1929, 181-182. Múnera responds: "They reported their findings in a sketchy paper with no error bounds, concluding that: 'The results gave no displacement as great as one-fifteenth of that to be expected on the supposition of an effect due to a motion of the solar system of three hundred km/s' (paper in *Nature*). Since they report a relative displacement, the corresponding solar velocity is then $300(1/15)^{1/2} = 77.5$ km/s, which is not null by any means. In the JOSA paper, they say that the relative displacement was one-fiftieth (= 1/50, a misprint?), leading to a solar velocity of 42.4 km/s. Again, a clearly non-null speed" (H. Múnera, "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, & Compatibility with Absolute Space," *Apeiron*, v. 5, Nr. 1-2, Jan-Apr 1998, p. 48).

[972] G. Joos, "Die Jenaer Wiederholung des Michelsonversuchs," *Annalen der Physik S.* 5, vol. 7, No. 4 (1930), 385-407. Joos used a quartz-based optical interferometer placed in a vacuum-metallic chamber with photographic detectors. He found that the "required" ethereal wind did not exceed a value of 1 km/sec. One reason Joos' results may have been low, as posited by V. A. Atsukovsky, is that the electrons in Joos' metal covering created a Fermi surface and thus partially shielded the apparatus from the ether's movement. He writes: "It is the same as making the attempt to measure the wind, which blows outdoors, looking at the anemometer in a closed room" (Yuri Galaev, "Ethereal Wind in Experience of Millimetric Radiowave Propagation," *The Institute of Radiophysics and Electronics of NSA in Ukraine*, Aug. 26, 2001, p. 212, translation improved). Galaev concludes: "The known works…cannot be ranked as experiments which could confirm or deny Miller's results [or] confirm or deny the hypothesis about the ether's existence in nature." Múnera adds: "…Joos' curves for individual measurements do not need to have the same amplitude and shape. Indeed, Joos observed such differences (see his figure 11, page 404). Unfortunately, Joos did not expect such variations (again, another instance of systematic error #2), so that he rejected all large amplitudes as due to experimental errors (he particularly mentions session 11 at 23:58). From smaller amplitudes, Joos obviously obtained a small velocity that he reported (translating from German) as 'an ether wind smaller than 1.5 km/s' (page 407). Even then, this is not a zero velocity" (Héctor Múnera, "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, and Compatibility with Absolute Space," *Apeiron*, Vol. 5, Nr. 1-2, January-April 1998, pp. 48-49).

interested in testing the "null" results switched to resonators, lasers, masers and other such sophisticated equipment.

In 1960 the team of Charles Townes and John Cedarholm tested the frequencies of microwaves emitted from two ammonia masers discharged in opposite directions, interchanging their positions every 24 hours. They reported a "null" result. In 1964, a team headed by T. S. Jaseja did a revision of Michelson-Morley's using lasers as the two sources of light, providing sharper lines to the fringe shifts. The results were again interpreted as "null."[973] In 1969 Jacob Shamir and R. Fox did an

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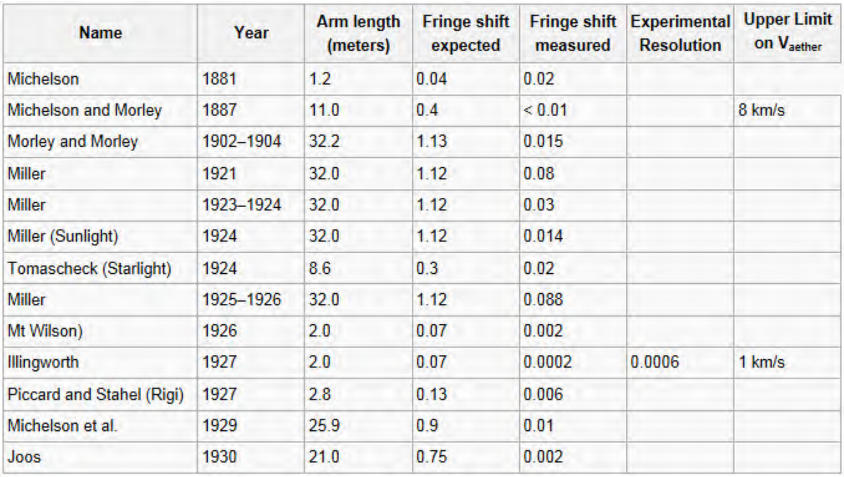
Robert Shankland categorized the experiments from Michelson to Joos in a 1955 article. He separates them into "Fringe Shift Expected" (FSE) and "Fringe Shift Measured" (FSM). The results he records are as follows:

1881 Michelson: FSE: 0.04, FSM: 0.02 [r = 50%];
1887 Michelson-Morley: FSE: 0.4, FSM: <0.01 [r = 2.5%];
1902-04 Morley-Miller: FSE: 1.13, FSM: 0.015 [r = 1.3%];
1921 Miller: FSE: 1.12, FSM: 0.08 [r = 7.1%];
1923-1924 Miller: FSE: 1.12, FSM: 0.03 [r = 2.6%];
1924 Miller (sunlight): FSE: 1.12, FSM: 0.014 [r = 1.2%];
1924 Tomascheck: FSE: 0.3, FSM: 0.02 [r = 6.62%];
1925-26 Miller: FSE 1.12, FSM: 0.088 [r = 7.8%];
1926 Kennedy: FSE: 0.07, FSM: 0.002 [r = 2.8%];
1927 Illingworth: FSE: 0.07, FSM: 0.0002 [r = 0.28%];
1927 Piccard and Stahel: FSE:0.13, FSM: 0.006 [r = 4.6%];
1929 Michelson: FSE: 0.9, FSM: 0.01 [r = 1.1%];
1930 Joos: FSE: 0.75, FSM: 0.002 [r = 0.26%]

(R. S. Shankland, et al., *Review of Modern Physics* 27:2, 167-178 (1955), my ratios supplied in brackets. Except for Illingworth and Joos, whose results may be accounted for by Atsukovsky's explanation; and Michelson's 1881 effort which Lorentz discounted, all the other experiments show a ratio of FSE:FSM ranging from 1.1% to 7.8%, which means that all the experiments were basically seeing the same thing – a slight ether drift within the same parameters. Interestingly enough, the 1887 Michelson-Morley has a FSE:FSM ratio of 2.5%, and here Shankland inserts "8 km/sec" as the "Upper Limit on Velocity of Ether." Although he shows no other "Upper Limit" values except for Illingworth at "1 km/sec," we would assume that the higher the ratio the higher the ether velocity. Proportionately, then, Miller's 1925 ratio of 7.8% would correspond to his findings of "10 km/sec."

[973] T. S. Jaseja, A. Javan, J. Murray and C. H. Townes, "Test of Special Relativity or of the Isotropy of Space by use of Infrared Masers," *Physical Review* 1, 133a: 1221-1225, 1964. The team used two Helium-Neon microwave masers mounted perpendicularly on a rotating table and recorded the periodic frequency between the two. They found that the frequency shift between the two masers was 275



Name	Year	Arm length (meters)	Fringe shift expected	Fringe shift measured	Experimental Resolution	Upper Limit on V_{aether}
Michelson	1881	1.2	0.04	0.02		
Michelson and Morley	1887	11.0	0.4	< 0.01		8 km/s
Morley and Morley	1902–1904	32.2	1.13	0.015		
Miller	1921	32.0	1.12	0.08		
Miller	1923–1924	32.0	1.12	0.03		
Miller (Sunlight)	1924	32.0	1.12	0.014		
Tomascheck (Starlight)	1924	8.6	0.3	0.02		
Miller	1925–1926	32.0	1.12	0.088		
Mt Wilson)	1926	2.0	0.07	0.002		
Illingworth	1927	2.0	0.07	0.0002	0.0006	1 km/s
Piccard and Stahel (Rigi)	1927	2.8	0.13	0.006		
Michelson et al.	1929	25.9	0.9	0.01		
Joos	1930	21.0	0.75	0.002		

[974]

experiment similar to Michelson-Morley using a laser-based optical system with a sensitivity of determining fringes to within 0.00003 of a fringe width. They report a “null” result but with an upper limit to the ether’s velocity against Earth of 6.64 km/s,[975] (which, again, is very close to the 5 km/sec found by Michelson and Morley). In 1970, R. Latham and J. Last performed a similar set of experiments and claimed to have produced a “null” result.[976]

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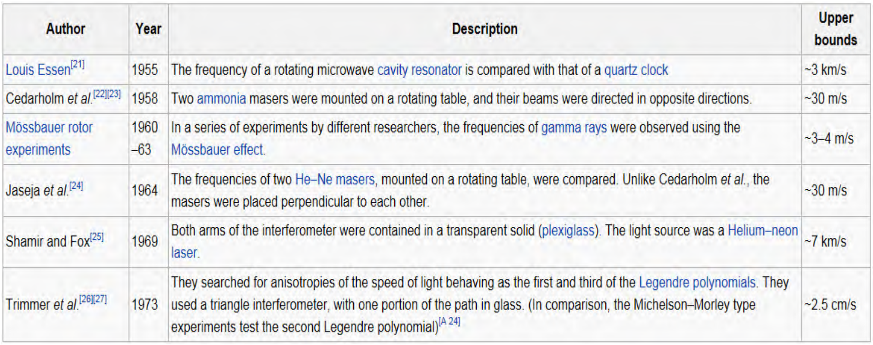
cycles/second, and they put an upper limit on the anisotropy of space at 30 m/sec. Prior to this C. H. Townes did a maser oscillator experiment in 1958, with similar results (*Physical Review Letters* 1, 352, 1958). See also Alan Kostelecký, “The Search for Relativity Violations.” Speaking of the same helium-neon masers, he writes: “Exceptional sensitivity to relativity violations has also been achieved in clock-comparison experiments….These experiments have attained the remarkable sensitivity of 10-31….Various clock-comparison experiments with atoms as clocks have been performed at other institutions, achieving sensitivities of 10^{-27} to 10^{-23} for different types of relativity violations involving protons, neutrons and electrons” (*Scientific American*, Sept. 2004, p. 100).

[974] Chart from Wikipedia article showing each experiment had a positive result, although not what would be expected if the Earth were moving around the sun at 30km/sec (http://en.wikibooks.org/wiki/Special_Relativity/Aether). The chart fails to record the ether velocities from Morley-Miller, Miller, Piccard, Michelson, et al, which all range from 5 to 10 km/s.

[975] J. Shamir and R. Fox, *Il Nuovo Cimento* 62B, No. 2, 1969, p. 258.

[976] R. Latham and J. Last, *Proceedings of the Royal Society of London*, A320, 131, 1970.



Author	Year	Description	Upper bounds
Louis Essen[21]	1955	The frequency of a rotating microwave cavity resonator is compared with that of a quartz clock	~3 km/s
Cedarholm *et al.*[22][23]	1958	Two ammonia masers were mounted on a rotating table, and their beams were directed in opposite directions.	~30 m/s
Mössbauer rotor experiments	1960–63	In a series of experiments by different researchers, the frequencies of gamma rays were observed using the Mössbauer effect.	~3–4 m/s
Jaseja *et al.*[24]	1964	The frequencies of two He–Ne masers, mounted on a rotating table, were compared. Unlike Cedarholm *et al.*, the masers were placed perpendicular to each other.	~30 m/s
Shamir and Fox[25]	1969	Both arms of the interferometer were contained in a transparent solid (plexiglass). The light source was a Helium–neon laser.	~7 km/s
Trimmer *et al.*[26][27]	1973	They searched for anisotropies of the speed of light behaving as the first and third of the Legendre polynomials. They used a triangle interferometer, with one portion of the path in glass. (In comparison, the Michelson–Morley type experiments test the second Legendre polynomial)[A 24]	~2.5 cm/s

[977]

In 1979, Alain Brillet and J. L. Hall repeated Jaseja's experiment with even more precision and reported that they also found "null" results.[978] Of course, although all of these experiments found the same "null" results, no one was giving consideration to the fact that a perfectly viable interpretation was that the Earth was standing still against a slow moving ether. Due to the popularity of Einstein's Relativity theory, all the interpretations sought to maintain a moving Earth without ether.

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[977] http://en.wikipedia.org/wiki/Michelson%E2%80%93Morley_experiment

[978] Brillet and Hall report: "Rotation of the entire electro-optical system maps any cosmic directional anisotropy of space into a corresponding frequency variation. We found a fractional length change $\Delta l / l = (1.5 \pm 2.5)$ u10^{-15}, with the expected P_2 (cos θ) signature. This null result represents a 4000-fold improvement on the best previous measurement of Jaseja *et al*" (*Physical Review Letters* 42, 549-552, 1979. H. C. Hayden disputes these null results, saying they originate from the way data has been interpreted (Hayden, *Galilean Electrodynamics* 1, 1990, pp. 10-71). Accordingly, Brillet and Hall also reported a frequency shift of 17 Hz, which was double the rotation rate of the interferometer table, but which they could not explain and left it as an "unknown." Later, others interpreted the 17Hz result as due to "the rotation of the Earth" (Aspden, *Physical Letters* 8, No. 9, 1981, p. 411). This "interpretation," of course, begs the question, since a rotating Earth has not been proven, subsequently leaving ether, in slight movement against Earth, to answer the discrepancy. Their difficulty, interestingly enough, leads right to the "ether entrainment" theory, that is, that a dynamic ether exists but remains with Earth, since Earth is imbedded in it. This leaves room for an explanation of the 1913 Sagnac interferometer experiment, which we will address later. In light of Brillet and Hall's results, some scientists have begun to speak of "quantum ether." In 1990 Hils and Hall did a similar experiment but with lasers mounted to the Earth for greater stability, and found the same results as Brillet and Hall (*Physical Review Letters* 64 (1990), p. 1697). In any case, Galaev reports that the reason those after Joos kept seeing a "null" result was due to the use of metal chambers. Since most of the experiments used gamma radiation as the light source, the experimenters covered their apparatus with metal to protect themselves from harm. Dayton Miller, whom we will address later, warned of using metal chambers for this very reason (Yuri Galaev, "Ethereal Wind in Experience of Millimetric Radiowave Propagation," *The Institute of Radiophysics and Electronics of NSA in Ukraine*, Aug. 26, 2001, p. 212).

The Geocentrism Connection

Before we analyze those results, let us address the important question of what a positive result to the interferometer experiments means for both the theory of Relativity and the concept of a stationary Earth. On the one hand, a positive result would completely destroy Einstein's theory of Relativity, since it would show that: (1) ether exists, and (2) either the ether or the Earth serves as the absolute reference frame by which all motion can be measured. As Einstein himself said: "If Michelson-Morley is wrong, then relativity is wrong."[979] It would mean that science has no rebuttal to the very experiment designed to show that the Earth was moving. It would mean that most, if not all, current physics would literally have to go back to the drawing board. But since modern science has put so much stock in Relativity, it has, to put it mildly, a vested interest in preferring a "null" result to the interferometer experiments. At the same time, however, each verification of a "null" result leaves open an equally viable interpretation, that is, the Earth is not moving. Obviously, then, with regard to "null" results from an interferometer, modern science is in a *Catch-22* situation.

On the other hand, a positive result could mean one of two things regarding the Earth. It could mean either that the Earth was traveling through the ether, or it could mean that Earth was stationary, and the ether was slowly moving against it. To support Copernicanism, modern physics could opt for the former, but this choice would automatically negate Relativity theory – a cherished commodity that few, if any, were willing to give up. A negative or null result, as we have seen, meant that physics had to find a reason why the speed of light was not impeded as it traveled in the direction of the Earth's apparent motion through the ether. Lorentz and Fitzgerald tried to solve this problem by saying that the apparatus measuring the speed of light contracted and thus wasn't able to measure any difference in speed. Einstein's solution was to dispense with the ether and say that there was no difference in light's speed. But neither Lorentz nor Einstein ever had to face *positive* results from an interferometer, or, as the history of interferometer experiments show, they made a concerted effort to deny or trivialize any positive results. If the result turned out to be positive, it would have made a laughing stock of the hypothetical contortions into which science allowed itself to fall when they thought the results were negative (*e.g.*, contracting matter, time dilation, twins aging at different rates, etc).

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[979] Stated to Sir Herbert Samuel on the grounds of Government House, Jerusalem (*Einstein: The Life and Times*, p. 107).

What about the Copernican Non-Relativists?

From another angle, perhaps we should not be so hard on the Relativists, for the non-Relativists also believe that the Earth moves even though they accentuate the positive results of the interferometer experiments against the Relativist's wish for negative results. It comes down to this: on the one hand, the non-Relativists are correct in their critiques of the illogical nature and absurd results of Relativity theory, but they have little in the way of proving their own position, since they cannot find irrefutable evidence for the elusive ether (that is, they only see effects, not substance) – an absence that has plagued their case since the time of Newton, Fresnel and Maxwell. Having no proof of ether, and having no immobile Earth, the non-Relativists are in almost as much of a dilemma as the Relativists, since wishing for absolutes is not nearly the same as possessing them. Notice how one non-relativist expresses this "wish":

> The relativists talk about accelerative (inertial) forces applying to some body when that body speeds up relative to some highly tangible reference, namely, all the mass in the universe [as did Einstein and Ernst Mach]. All that is necessary to convert this reference frame is to identify some representative central position for all mass, with respect to which inertial forces in accelerating bodies actually occur. Our knowledge of the universe does not at present permit one to say precisely how to define this representative central position. But one possibility that presents itself *is that of the centroid of the universe* (*center of mass*), *the point at which the universe would balance if the universe could somehow be weighed*. But the precise definition of this representative central position of all matter is not needed in order to suppose that it exists as physically relevant, as the reference point with respect to which all accelerations occur.[980]

Suffice it to say that, geocentrism holds precisely to what Turner envisions as the solution to the "Relativity" problem, only it is Earth that is the "centroid of the universe (center of mass), the point at which the universe could balance if…weighed.” That’s why Earth doesn’t move. As we noted earlier, contrary to popular opinion, Newton’s laws of motion do not hold that the smaller body will necessarily revolve around the larger body; rather, both bodies will revolve around the “center of mass.” If there are more than two bodies involved, then all the bodies, even if there are trillions of them, will all revolve, in some way, around the center of mass.[981] Hence, if we could “weigh” all the bodies of the universe, they would have one center of mass. It is no stretch of logic to say that the center of mass would be in the approximate center of all the masses; and thus, there is one central point in the universe upon which all the bodies of the universe revolve. That being the case, there is absolutely no reason why that central point cannot have Earth as its base.

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[980] Dean Turner in *The Einstein Myth*, Part 1, p. 39, emphasis added.

Another such admission by a well-known, non-relativist, Arthur Lynch, is worth noting:

> Descartes is, however, doubly interesting to us in the discussion of Relativity, for at one time when the Inquisition was becoming uneasy about his scientific researches, he gave them a reply that satisfied them, or perhaps he merely gained time, which was long, while they were trying to understand its meaning. He declared that the sun went around the Earth, and that when he said that the Earth revolved around the sun that was merely another manner of expressing the same occurrence. I met with this saying first from Henri Poincaré, and I thought then that it was a witty, epigrammatic way of compelling thought to the question; but on reflexion I saw that it was a statement of actual fact. The movements of the two bodies are relative one to the other, and it is a matter of choice as to which we take as our place of observation.[982]

How to Correctly Interpret an Interferometer

Let us return to the war of the interferometers. Once again, what is significant about the results in the foregoing interferometer experiments is that each of them actually showed a small positive result, but because the result did not match expectations for what was assumed to be the only possible result if the Earth were moving through ether, each experimenter declared his results “null.” But they were not null. Michelson and Morley write about their small positive results as follows:

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[981] Newton’s Corollary IV under Laws of Motion, Law III, states: “The common center of gravity of two or more bodies does not alter its state of motion or rest by the actions of the bodies among themselves: and therefore the common center of gravity of all bodies acting upon each other (excluding outward actions and impediments) is either at rest, or moves uniformly in a right line.”

[982] Arthur Lynch, *The Case Against Einstein*, p. 22.

> On the Relative Motion of the Earth and the Luminiferous Ether: The actual displacement was certainly less than the twentieth part of this...It appears, from all that precedes, reasonably certain that if there be any relative motion between the Earth and the luminiferous ether, it must be small; quite small enough entirely to refute Fresnel’s explanation of aberration, and that the velocity of the Earth with respect to the ether is probably less than one-sixth the Earth’s orbital velocity, and certainly less than one-fourth.[983]

While it is extremely difficult to find in the scientific literature that Michelson-Morley found a small positive result (since, as Einstein himself said, it would nullify his Relativity theory), today, those that have little vested interest in saving Relativity theory but seek to find a more precise and comprehensive answer to how the universe works, are not ashamed to admit the result. For example, in a throwback to Michelson-Morley, Craig Hogan, director of Fermilab, is planning to use a dual Michelson-Morley apparatus to find the Planck ether. One of the reasons he is pursuing this experiment is, as Michael Moyer of *Scientific American* indicates, is that…

> Back when Michelson and Morley were investigating the (nonexistent) ether, their interferometer measured a tiny change–the change in the speed of light as the earth moved around the sun–by comparing two light beams that had traveled a reasonably long way. So it is with Hogan’s Holometer.[984]

What, precisely, do all these figures mean in regard to the heliocentric/geocentric debate? In the heliocentric theory, the Earth is moving through the ether with both a diurnal and translational movement, that is, it spins on its axis at about 1054 mph (0.45 km/sec) and orbits the sun at about 66,000 mph (30 km/sec), which means that the Earth’s rotation speed is 1.6% of its revolution speed.[985] Clearly, then, the bulk of the ether resistance against the Earth will come from the translational movement as opposed to the diurnal rotation. But if we subtract the translational movement, the remaining resistance will come only from the diurnal movement. This situation is identical to what would occur in the geocentric model, since in the geocentric system there is no translational movement of the Earth against the ether, yet there is a diurnal movement. In other words, the universe's ether is rotating around a fixed Earth at the same rate that the Earth in the heliocentric system would be rotating against the fixed ether, that is, on a 24-hour basis. Accordingly, in the geocentric system only the diurnal movement of the Earth against the ether will show up as fringe shifts in the interferometer experiments, and thus we would expect a measurement of shifts much less than the fringe shifts corresponding to the translational movement of 30 km/sec. All things being equal, we would expect the diurnal movement to produce fringe-shifting corresponding to a mere fraction of the fringe-shifting expected for 30 km/sec. This is precisely what we find in the description given above by Michelson and Morley (albeit, they did not attribute it to a non-translating Earth). They tell us that: "The actual displacement was certainly less than the twentieth part of this."[986] A "twentieth part" of the fringe shifting corresponding to 30 km/sec yields fringe shifting of at least 1.5 km/sec.

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[983] “On the Relative Motion of the Earth and the Luminiferous Ether,” Art. xxxvi, *The American Journal of Science*, editors James D and Edward S. Dana, No. 203, vol. xxxiv, November 1887, p. 341.

[984] Michael Moyer, “Is Space Digital,” *Scientific American*, February 2012, p. 36.

[985] However, in terms of acceleration, where $a = v^2/r$, the translation is only 5% of the rotation.

After Michelson and Morley run these figures through their calculations in order to make the square of the velocity proportional to the displacement, they then tell us: "the velocity of the Earth with respect to the ether is probably less than one-sixth the Earth's orbital velocity, and certainly less than one-fourth." One sixth of 30 km/sec is 4.8 km/sec, which agrees closely with the average of 5 km/sec in the other interferometer experiments. In brief, the geocentric model has a simple explanation for the unexpected results of the Michelson-Morley experiment: the Earth is fixed and the universe and ether rotate around it.

Perhaps just as important concerning the Michelson-Morley experiment was, even with this small evidence of ether movement, the two scientists concluded that Fresnel's "explanation of aberration" was "refuted" by their 1887 interferometer experiment. We will recall that Fresnel explained Arago's stellar aberration results by postulating that it was caused by glass mediums "dragging" ether against an *immobile* ether that surrounded the glass. Interestingly enough, Michelson and Morley had previously stated in 1886 that, after the repeat of Fizeau's experiment in

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[986] "On the Relative Motion of the Earth and the Luminiferous Ether," Art. xxxvi, *The American Journal of Science*, eds. James D and Edward S. Dana, No. 203, vol. xxxiv, November 1887, p. 341.

1884, they had, at that time, confirmed Fresnel's formula stating: "the result of this work is therefore that the result announced by Fizeau is essentially correct: and that *the luminiferous ether is entirely unaffected by the motion of the matter which it permeates*."[987] So we have Michelson and Morley giving us two different stories, but the one to which they adhere is the 1887 judgment showing that science had no answer to Arago's experiment and that the Earth's 30 km/sec clip through space was coming to a screeching halt unless somebody could come up with an explanation.

Still, since the measured ether movement came nowhere near the expected 30 km/sec, the science community invariably considered the Michelson-Morley results as "null." There were a few voices, however, that did not consider the results trivial. As early as 1902, W. M. Hicks, made a thorough criticism of the experiment and concluded that instead of giving a null result, the numerical data published in Michelson-Morley's paper shows distinct evidence of an expected effect (*i.e.*, ether drift). Unfortunately, the science community has completely ignored Hicks' paper.[988]

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[987] "Influence of Motion of the Medium on the Velocity of Light," *American Journal of Science*, 31:386-377, 1886, emphasis in the original.

[988] Hicks writes: "…the adjustment of the mirrors can easily change from one type to the other on consecutive days. It follows that averaging the results of different days in the usual manner is not allowable unless the types are all the same. If this is not attended to, the average displacement may be expected to come out zero – at least if a large number are averaged" (W. M. Hicks, "On the Michelson-Morley Experiment Relating to the Drift of the Ether," *Philosophical Magazine,* Series 6, vol. 3, 1902, p. 34, see also pp. 9-42. Hicks is cited in Héctor A. Múnera's "An Absolute Space Interpretation of the Non-Null Results of Michelson-Morley and Similar Experiments" in *Apeiron*, Vol. 4, No. 2-3, April-July 1997, who, in turn, cites E. T. Whittaker's two volume work *A History of the Theories of Ether and Electricity* (1887), which mentions Hicks' work, minus the negative conclusion of Michelson-Morley. A year later, Múnera wrote "Michelson-Morley Experiments Revisited: Systematic Errors, Consistency Among Difference Experiments, and Compatibility with Absolute Space." He states: "Despite the null interpretation of their experiment…it is quantitatively shown that the outcomes of the original experiment, and all subsequent repetitions, never were null. Additionally, due to an incorrect inter-session averaging, the non-null results are even larger than reported" (*Apeiron*, Vol. 5, Nr. 1-2, January-April 1998, p. 37). Summarizing the findings, M. Consoli and E. Costanzo write: "The Michelson-Morley experiment was designed to detect the relative motion of the Earth…by measuring the shifts of the fringes in an optical interferometer. These shifts…were found to be much smaller than expected.…However…the fringe shifts observed by Michelson and Morley, while certainly smaller than the classical prediction corresponding to the orbital velocity of the Earth, were *not* negligibly small. This point was clearly expressed by Hicks: '…the numerical data published in the Michelson-Morley

Georges Sagnac's 1913 Interferometer Experiment

There have been few interferometer results that have been more puzzling to Relativists, and by the same proportion more ignored, than the 1913 experiment performed by the French physicist, Georges Sagnac (pronounced: Sanyak). Sagnac was a professor of theoretical physics at the University of Paris. Among his previous contributions are the assisting of Pierre Curie in determining the properties of radium, as well as the discovery of secondary X-rays and various other optical effects. His interferometer results have been repeated several times, so it is rather curious why the science establishment has been so averse to publicizing Sagnac's work the same way they advertise Einstein's.[989] Interestingly enough, Sagnac employed the same principle as the Michelson-Morley

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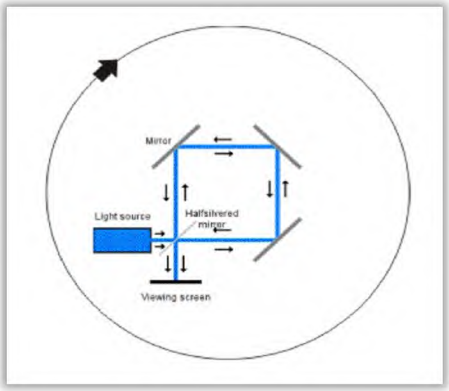
paper, instead of giving a null result, show a distinct evidence of an effect of the kind to be expected' and also by Miller. In the latter case, Miller's refined analysis of the half-period, second-harmonic effect observed in the original experiment, and in the subsequent ones by Morley and Miller [1905], showed that all data were consistent with an effective, observable velocity lying in the range of 7-10 km/s. For comparison, the Michelson-Morley experiment gave a value $v_{\text{obs}} \sim 8.8$ km/s for the noon observations and a value $v_{\text{obs}} \sim 8.0$ km/s for the evening observations" ("The Motion of the Solar System and the Michelson-Morley Experiment," Istituto Nazionale di Fisica Nucleare, Sezione di Catania Dipartimento di Fisica e Astronomia dell' Università di Catania, November 26, 2003, p. 1). The authors add: "Our findings completely confirm Miller's indication of an observable velocity $v_{\text{obs}} \sim 8.4$ km/s in their data."

[989] Notable exceptions are E. J. Post in *Reviews of Modern Physics* 39, 1967, pp. 475-493; Herbert Goldstein, *Classical Mechanics*, 1980; and Stefan Marinov in *Foundations of Physics* 8, 1978, pp. 137-156. The first to suggest a Sagnac-type rotating interferometer was Sir Oliver Lodge in 1897 (*Philosophical Transactions of the Royal Society*, London, 189, 149 (1897); R. Anderson, et al., *American Journal of Physics*, 62, 975, 1994). Based on classical physics, Lodge predicted the fringe shifts to be in accord with the formula $\Delta z = 4\Omega S/\lambda c$ where Ω is the constant angular velocity vector of the turntable, S is the vector representing the area enclosed by the light path, and λ is the wavelength of light *in vacuo*. The time difference of the fringe shifts comes out to be $\Delta t = \lambda\Delta z/c = 4\Omega S/c^2$. A few years prior to Sagnac's experiment, Franz Harres, graduate student of Jena, had unknowingly produced the Sagnac effect during experiments testing the Fresnel drag ("Die Geschwindigkeit de Lichtes in bewegten Korpern," Ph.D. dissertation, Univ. of Jena, Germany, 1912). It was P. Harzer, in 1914 (*Astronomische Nachrichten*, 199, 337) who discovered the anomaly in Harres' work as the Sagnac effect, after Sagnac had successfully produced it in 1913. Harres showed that the Sagnac fringe shift is unaffected by refraction.

experiment.[990] As Sagnac himself describes it, his is the typical **interferometer** methodology:

> "I cause to revolve uniformly, at one or two revolutions per second, around a vertical axis, a horizontal platform (50 centimeters in diameter) carrying, solidly screwed down, the various pieces of an interferometer similar to that which I have used in my previous researches and described in 1910. The two interfering beams, reflected by four mirrors placed at the edge of the revolving platform, are superimposed in opposite directions upon one self-same horizontal circuit encompassing a definite area S. The rotating assemblage includes also the luminous source (a small electric lamp), and the receiver – a fine-grained photographic plate, which registers the interference fringes localized at the focus of a telescope. Photographs designated *cw* are obtained during a clockwise rotation of the platform; photos designated *ccw* are obtained during a counter-clockwise rotation of the same frequency. In these two kinds of photos, the center of the central fringe presents two different positions. I measure this displacement of the center of interference."[991]



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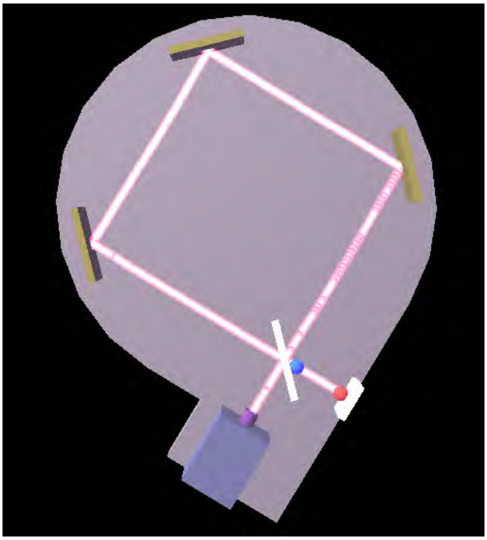
[990] *Comptes Rendus de l' Acadèmie des Sciences* (Paris) 157, 1913, pp. 708-710, 1410-1413, as cited in *The Einstein Myth and the Ives Papers*, pp. 247-248. Einstein's biographer, Ronald Clark, who does not hide his favoring of Einstein, fails to mention Sagnac's experiment in his over 800+ page book. Instead, he makes a passing comment: "There might be debate over details, the third proof had not yet been obtained, and there were to be several attempts – all either unsuccessful or inconclusive – to show that the outcome of the Michelson-Morley experiment itself could be faulted" (*Einstein: The Life and Times*, p. 304).

[991] *Comptes Rendus*, *ibid.*



Sagnac's rotating interferometer producing a difference in photon velocity[992]

The difference between the Michelson-Morley experiment and the Sagnac experiment is that the former directs the light beam to traverse back and forth along the diameter of a rotating table, whereas the latter directs the light beam to travel in a closed circle on a rotating table. As such, the Michelson-Morley experiment seeks to detect the translational movement of the Earth, whereas the Sagnac experiment seeks to detect the rotation of the Earth (or, in geocentric terms, the rotation of the universe around the Earth). Sagnac explains what he will be observing:

> In clear conception, it ought to be regarded as a direct manifestation of the luminiferous ether. In a system moving as a whole with respect to the ether, the elapsed time of propagation between any two points of the system should be altered as though the system were immobile and subject to the action of an *ether wind* which would blow away the light waves in the manner of atmospheric wind blowing away sound waves. The observation of the optical effect of such a relative wind of ether would constitute *evidence for the ether*, just as the observation of the influence of the relative wind of the atmosphere on the speed of sound in a system in motion would (in the absence of a better

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[992] See CDROM animation of the Sagnac experiment.

> explanation) constitute evidence of the existence of the atmosphere around the system in movement.[993]

He then explains his results:

> It has been very easy for me to find at the outset the evidence for the ether by causing a small optical circuit to rotate. A frequency N of 2 revolutions per second (successively in each direction) has furnished me a degree of relative whirling of the ether of 4πN or 25 radians per second. A uniform clockwise rotation of the interferograph produces, relatively, a counter-clockwise ether wind….The distance between the fringes is here from 0.5 to 1 millimeter….The observed interference effect is clearly the optical whirling effect due to the movement of the system in relation to the ether and directly manifests the existence of the ether, supporting necessarily the light waves of Huygens and of Fresnel.[994]

What is probably equally important is Sagnac's explanation for what appear to be "null" results in his experiment and, by extension, the null results of other similar experiments, namely, Michelson-Morley.

> The total interferential displacement *z* is a constant fraction of the distance between fringes, for the same frequency N of rotation. The displacement becomes invisible on the photographs when the fringes have been adjusted to be narrow enough. Such a nullified result demonstrates that the normally observed displacement is clearly due to a difference of phase associated with the rotational movement of the system.[995]

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[993] *Comptes Rendus*, *ibid.*, emphasis added.

[994] *Comptes Rendus*, *ibid*. In a more detailed explanation in the *Comptes Rendus* of December 22, 1913, pp. 1410-1413, Sagnac adds: "The result of the measurements demonstrates that, in ambient space, light is propagated with a velocity V_0, independent of the movement as a whole of the luminous source O and the optical system. That is a property of space which experimentally characterizes the luminiferous ether. The interferograph measures, as ¼ $z\lambda V_0$, the relative circulation of the ether within the closed optical circuit." (Translated by Richard Hazlett). Sagnac added another article in *Journal de Physique et le Radium*, fifth series, 4, 1914, pp. 177-195.

[995] *Comptes Rendus*, *ibid*. Interestingly enough, Sagnac's 1913 discovery of the ether was predicted by none other than Albert Michelson, as noted in *Philosophical Magazine*, London, sixth series, 8, 1904, pp. 716-719. He predicted

In brief, what Sagnac's experiment shows is, because one of the light beams took a longer time to reach the mirror moving away from it than the other light beam whose mirror was moving toward it, the postulate of Special Relativity (which holds that *the speed of light is the same for all observers*), does not hold. Clearly, there were two different speeds for the light beams traveling the same distance. So what is making one of the light beams travel slower? Sagnac said it was due to the ether impeding its velocity – a resistance that is easily generated by rotating the table. So predictable and precise are these results that the "Sagnac effect," as it is commonly called, is used routinely in today's technology for the purpose of sensing rotation, as well as in mechanical gyroscopes. As noted above, in 1904 Albert Michelson had already predicted that observers on Earth, if they are co-moving and co-rotating with the light source and screen, will observe an interference pattern that is dependent on the absolute rotation of the system. This is precisely what Sagnac demonstrated, but using a laboratory turntable with two mechanical receivers instead of two human observers. Sagnac's interferometer is the "observer," and its light source and reflecting mirrors were all co-moving and co-rotating in one and the same fixed system. The only thing that Sagnac added from outside the system was putting the turntable in motion. Sagnac saw the equipment rotating, but the interferometer was the real, objective "observer," and it recorded fringe shifts in that observation, demonstrating that the speed of light was not constant. Today's Relativists conveniently dismiss this evidence and claim that Special Relativity does not work for rotating systems; or, they may insist it *does* work in rotating systems, but without

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that observers on Earth, if they are co-moving and co-rotating with the light source and screen, will observe an interference pattern that will be dependent on the absolute rotation of the system. Michelson did a similar experiment to Sagnac's with Henry Gale in 1925 and produced the same results. In 1925 B. Pogany reports a repeat of Sagnac's experiment with the same results (Über die Wiederholung des Harres – Sagnaschen Versuches. *Ann. Phys*., 1926, 80, p. 217-231). The same results were repeated by Dufour and Prunier and reported in 1937 (*Comptes Rendus* 204, 1925, 1937). The results were later confirmed with modern equipment and high precision by W. M. Macek and D. T. M. Davis, Jr., and as described in *Applied Physics Letters* 2, 1963, pp. 67-68. Sagnac interpreted his results, as did others in the scientific community, to nullify Special Relativity. (See: John Chappell, "Georges Sagnac and the Discovery of the Ether," *Arch. Internat. d'Histoire des Sciences*, 18:175-190, 1965; F. Selleri, *Foundations of Physics*, 26, 641, 1996; *Foundations of Physics Letters* 10, 73, 1997; J. Croca, *Nuovo Cimento B*, 114, 447, 1999; F. Goy, *Foundations of Physics Letters* 10, 17, 1997; J. P. Vigier, *Physical Letters A*, 234, 75, 1997; P. K. Anastasowski et al., *Foundations of Physics Letters*, 12, 579, 1999).

revealing that it will not do so unless it adds in foreign elements belonging to General Relativity, such as "metric tensors" and the like.[996]

We pause here to mention a very important consequence of Sagnac's experiment. In light of the experiment's clear demonstration of absolute motion, physicists of the Copernican yet non-Relativity variety have commonly interpreted Sagnac's results as being evidence for the absolute rotation of the Earth. From their cosmological perspective, this conclusion is certainly understandable. By the same token, however, if other evidence shows that Earth is not moving diurnally (which is strongly indicated by the stellar aberration experiments of Arago, Airy, *et al.*), then Sagnac's results would be positive proof for the absolute rotation of the universe around the Earth, as well as for the existence of ether and absolute space. Sagnac's results (which bring science right back to the Maxwell/Fresnel/Arago/Airy ether) are so solid and irrefutable that current physics finds itself in the unenviable position of having to use Sagnac's discovery to make their Relativistic formulas function. The popular Global Positioning System, for example, cannot function properly without adjustments based upon Sagnac's experimental results. Not surprisingly, then, whenever the need arises for inertial navigation (*i.e.*, an absolute frame from which to measure all other coordinates), the Sagnac effect is always included.[997] The Sagnac effect is a universal principle for all electromagnetic counter-propagating beams, as well as neutron beams, de Broglie waves and even sound waves, that is, any waves which travel in opposite paths.[998] All the various beams and waves show the same time differences, both for matter and light, independent of the physical nature of the interference. These various testing elements show that the Sagnac effect is not dependent on the nature of light, *per se*, but solely on the principle of absolute motion. Ring laser experiments have confirmed the Sagnac effect to within one part in 10^{20}, a truly remarkable verification.[999]

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[996] Post and Goldstein, to coincide Sagnac with the assertion that the speed of light is constant only in an inertial frame, answer Sagnac by imposing an infinite sequence of inertial coordinate frames in the circumference of the rotating apparatus. Almost all others use General Relativity to explain Sagnac, *e.g.*, W. Schleich and M. O. Skully, "Course 10: General Relativity and Modern Optics," *New Trends in Atomic Physics*, Elsevier Science Publishers, Amsterdam-New York, 1982; M. A. Tonnelat, *Les principes de la théorie électromagnétique et de la relativité*, Masson, Paris, 1959; Oyvind Grøn, "Relativistic Description of a Rotating Disk," *American Journal of Physics* 43, 10:869f, 1975; G. Rizzi and M. Ruggiero, *Relativity in Rotating Frames*, Kluwer Academic Publishers, Dordrecht, 203; G. Rizzi and A. Tartaglia, "Speed of Light on Rotating Platforms," *Foundational Physics*, 28:1663, 1998; Berenda, "The Problem of the Rotating Disk," *Physical Review* 62:280f, 1942; Ashtekar and Magnon, "The Sagnac Effect in General Relativity," *Journal of Mathematical Physics*, 16, 2:341, 1975; J. –F. Pascual Sánchez et al., "Geometry of an Accelerated Rotating Disk," Universidad de Valladolid, Spain, 2003. See section in "Does Ether Exist" for General Relativity's answer for rotating discs.

[997] *Laser Applications*, ed. Monte Ross, written by F. Aronowitz, New York, Academic Press, 1971, vol. 1, pp. 133-200; E. J. Post, *Review of Modern Physics*, 39, 2, 475, 1967; W. W. Chow et al., *Review of Modern Physics*, 57, 61, 1985; V. Vali and R. W. Shorthill, *Applied Optics*, 15, 1099, 1976; G. E. Stedman, *Rep. Prog. Phys*. 60, 615, 1997. The Sagnac effect has been measured not just with

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light waves, but also with matter waves using Copper pairing (J. E. Zimmermann and J. E. Mercerau, *Physical Review Letters*, 14, 887, 1965); with neutrons (D. K. Attwood, *et al.*, *Physical Review Letters*, 52, 1673, 1984; S. A. Werner et al., *Physical Review Letters*, 42, 1103, 1979); and Ca^{40} atom beams (F. Riehle et al., *Physical Review Letters*, 67, 177, 1991); and with electrons (F. Hasselbach and M. Nicklaus, *Physical Review A*, 48, 143, 1993).

[998] *Cf.*, Anderson et al., *American Journal of Physics*, 62, 11:975, 1994 and Post, "Sagnac Effect," *Review of Modern Physics* 39, 2:475, 1967 showing the Sagnac effect in ring interferometers; Hasselbach and Nicklaus, *Physical Review A*, 48, 1:143, 1993 showing Sagnac effect using electrons.

[999] Much of the research comes from the Canterbury Project. Some of the many reports include: H. R. Bilger, G. E. Stedman, Ziyuan Li, U. Schreiber and M. Schneider, Ring lasers for geodesy, IEEE Transactions on Instrumentation and Measurement (special issue for CPEM/94: Conference on Precision Electromagnetic Measurements, Boulder CO, June 27-July 1, 1994) 44: 468-470, 1995; H. R. Bilger, U. Schreiber, and G. E. Stedman, "Design and application of large perimeter ring lasers," Symposium Gyro Technology, Stuttgart, Germany, 17-18 September 1996; V. Rautenberg, N. P. Plag, M. Burns, G. E. Stedman and H. U. Juttner, "Tidally induced Sagnac signal in a ring laser," *Geophys. Res. Lett.* 24, 8, 893-896, 1997; R. Anderson, H. R. Bilger and G. E. Stedman, "The 'Sagnac' effect: a century of earth rotated interferometers," *American Journal of Physics* 62: 975-985, 1994; H. R. Bilger, G. E. Stedman, M. P. Poulton, C. H. Rowe, Li Ziyuan and P. V. Wells, "Ring laser for precision measurement of non-reciprocal phenomenas," IEEE Transactions on Instrumentation and Measurement 42: 407-411, 1993; G. E. Stedman, K. U. Schreiber and H. R. Bilger, "On the detectability of the Lense-Thirring field from rotating laboratory masses using ring laser gyroscope interferometers," *Classical Quantum Gravity* 20, 13: 2527-2540, 2003; G. E. Stedman and B. G. Wybourne, "Beyond the sixth place of decimals: From Michelson to large ring lasers," *Bulletin de la Société des Sciences et des Lettres de Lódz 53* (Série: Recherches sur les déformations vol 39): 47-56, 2003; U. Schreiber, M. Schneider, C. H. Rowe, G. E. Stedman, S. J. Cooper, W. Schlüter and H. Seeger, "The C-II ring laser project," *Phys. Chem. Earth* A 25 (12): 805-807, 2000; C. H. Rowe, K. U. Schreiber, S. J. Cooper, B. T. King, M. Poulton and G. E. Stedman, "Design and operation of a very large ring laser gyroscope," *Applied Optics* 38 (12): 2516-2523, 1999; G. E. Stedman, "Ring laser tests of fundamental physics and geophysics," *Rep. Prog. Phys*. 60: 615-688, 1997.

To escape the embarrassment, Relativists will claim many and varied reasons for Sagnac's results.[1000] One theory, promoted by French physicist **Paul Langevin** in 1921,[1001] held that due to Relativity's principle of co-variance, the universe can be thought of as rotating around Sagnac's stationary platform, and thus the universe's "radiant energy" is dragging the light in the interferometer around with it. This circular motion of the universe creates a centripetal acceleration toward the center of rotation. It was admitted later, however, that this solution would involve changing the speed of light from a constant value, not to mention allowing for an Earth in the center of a rotating universe.

In 1937, Langevin proposed another solution. This time he introduced the idea of "non-uniform local time," thus allowing for a constant value for the speed of light. In the following year of 1938, Herbert Ives showed that Langevin's 1937 proposal would end up making two clocks that were operating on "non-uniform local time" tell different times in the same place. As Ives put it: "The performer of the experiment must avoid looking at both clocks at once!"

Ives also showed that Langevin's 1921 solution was not viable, since Sagnac's experiment involves no consideration of rotation.[1002] In other words, Ives discredited the common notion, even one that is believed today by Global Positioning Satellite engineers, that the Sagnac effect is caused by rotation. As Wang notes from his extensive empirical testing: "A rotating frame of reference is usually used in explanations but….the travel-time difference of two counter-propagating light beams in moving fiber is proportional to both the total length and the speed of the fiber regardless of whether the motion is circular or uniform."[1003]

[1000] For example, "The Sagnac Phase shift suggested by the Aharonov-Bohm effect for relativistic matter beams," Guido Rizzi et al., May, 2003. Rizzi includes a list of about a half-dozen Relativists. Suffice it to say, Rizzi's paper is filled with a dizzying array of mathematical contrivances and contortions in order to explain Sagnac from a Relativistic point of view.

[1001] *Comptes Rendus* 173, 831-834, 1921.

[1002] "Light Signals Sent Around a Closed Path" in the *Journal of the Optical Society of America*, April 16, 1938, Vol. 28. Ives writes: "The net result of this

Unfortunately, Ives' explanation has been totally ignored in the physics literature. This is no surprise, considering Langevin's *ad hoc* attempts at trying to deal with Sagnac's results to salvage Relativity. Langevin also tried to argue that, although Special Relativity could not answer the centrifugal effect, General Relativity could offer an answer, since a centrifugal force would not exist if all other gravitational forces were eliminated from the universe. This was obviously a question-begging proposal, since its terms would be impossible to satisfy, and as such, it disproved Langevin's proposal by itself.

There is even more here than meets the eye. In the first case, although Langevin's suggestion that the universe's rotation causes the Sagnac effect was a convenient Relativistic attempt at solving the problem, in effect, it helps show precisely what the geocentrist argues regarding the Earth's motionlessness. That is, if Relativists insist on resorting to a universe in rotation against a stationary Earth in order to explain the Sagnac experiment, then there is no great leap in proposing that this is precisely

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study appears to be to leave the argument of Sagnac as to the significance of his experiment as strong as it ever was. The suggested use of 'local time' merely offers another way of measuring the effect of rotating the apparatus, namely in terms of the differences between two clocks carried around a circuit, instead of difference of arrival time of two light signals sent around the same circuit. The rotation, which can be measured in either of these ways, is not relative rotation of the apparatus with respect to the platform on which it is mounted, or to the laboratory – either of these might be rotated with respect to the apparatus, with no resultant Sagnac effect. The observer on the apparatus has just one reference framework by which he can predict whether the Sagnac effect will appear or not; that framework is the pattern of radiant energy from the stars. If his apparatus rotates with respect to the stars he will observe a Sagnac effect, if it does not, then no matter how great relative rotation it exhibits with respect to its material surroundings, there will be no Sagnac effect." See also "Sagnac effect: A century of Earth-rotated interferometers," R. Anderson, et al, American Journal of Physics 62(11), November 1994. Anderson states: "Harress…demonstrates that the Sagnac fringe shift is unaffected by refraction."

[1003] "Modified Sagnac experiment for measuring travel-time difference between counter-propagating light beams in a uniformly moving fiber," Ruyong Wang, *et al.*, *Physics Letters* A 312 (2003), pp. 1, 4.

what occurs in reality, and against which the Relativist cannot mount any satisfactory objections, since the very principle of equivalence posits that there is no difference between a rotating universe around a stationary Earth and the Earth spinning inside a stationary universe. In effect, the only thing Relativity's equivalence principle accomplishes is a reopening of the dispute between Galileo and the Catholic Church, with the latter side holding much more scientific evidence than it did in 1633. As Einstein admitted: "It follows from this that our notions of physical reality can never be final. We must always be ready to change these notions…"[1004] Or, as Martin Gardner stated it for the Relativity enthusiast:

> Indeed from the standpoint of relativity the choice of reference frame is arbitrary. Naturally, it is simpler to assume the universe is fixed and the Earth moving than the other way around, but the two ways of talking about the Earth's relative motion are two ways of saying the same thing.[1005]

As we will see later, it is precisely this matter of the equivalency principle that Mach argued with Einstein in their personal letters, and the very principle from which Einstein formed his own Relativity theory. In fact, in the Machian model, the gravity of the stars (in rotation with the universe around a stationary Earth) provided the long sought-after physical/mechanical answer to why centrifugal force exists, that is, because the gravity of the stars is pulling on the object. As Clark writes of Einstein:

> The idea that the system of fixed stars should ultimately determine the existence of centrifugal force was an important part of the conceptual background to the General Theory of Relativity. This was not a new idea and had been put forward in general terms by both Berkeley and Mach.[1006]

Models that depend solely on a moving Earth (without consideration of the gravity of the stars) have no such recourse and must resort to viewing the centrifugal and Coriolis phenomena as secondary effects, not as primary forces.

Second, Langevin's dependence on the "radiant energy" of the universe as the medium which moves against Sagnac's stationary apparatus shows, once again, that, although Relativists keep insisting that there is no ether medium between Earth and the stars, they are forced, nevertheless, to resort to it to explain the effects of experiments that are utterly dependent on its inclusion. To paraphrase Shakespeare, a rose by any other name is still a rose, and "radiant energy," by any other name, is still some type of ether medium.

[1004] Albert Einstein, *Ideas and Opinions*, 1984, p. 266.

[1005] Martin Gardner, *The Relativity Explosion*, 1976, p. 185.

[1006] *Einstein: The Life and Times*, p. 266.

The 1925 Michelson-Gale Experiment Discovers Sidereal Rate of Relative Rotation between Earth and Universe

Since, with Langevin's admission, Sagnac's experiment was performed with reference to the stars, not the apparatus, Albert Michelson must have been very intrigued by the result of Sagnac's 1913 experiment, for it showed an effect that was demanding an adjustment to his conclusion from the experiment he performed with Edward Morley in 1887. Sagnac had established quite conclusively that light does not have a constant speed unless it is understood to be traveling in absolute space. With Langevin's failure, and with that, General Relativity's failure to explain Sagnac's results (since the Sagnac effect is not due to rotation, which eliminates acceleration as the cause), Michelson was forced back to the drawing board. Michelson knew he had to create a more sophisticated apparatus to test for ether than his 1887 effort. Since Morley had died in 1923, Michelson found a new partner, Henry G. Gale, a man who demonstrated such devotion to the effort that he was named as a co-author. The newspapers had picked up on the story and, advertising it with all the drama of Hollywood, wrote headlines such as "Einstein on Trial" or "Michelson Leads Flank Attack upon the German Scientist." In any case, Michelson's abstract states the following:

> Theory of the effect of the rotation of the Earth on the velocity of light as derived on the hypothesis of a fixed ether. Historical Remarks: The theory was given originally in 1904. The experiment was undertaken at the urgent instance of Dr. L. Silberstein. A preliminary experiment at Mount Wilson in 1923 showed that it was necessary to resort to an exhausted pipeline.

Ludwik Silberstein, a physicist himself, was so insistent because he had written an article in 1921 discussing the difficulty Relativity theory might have in explaining optical rotational phenomena.[1007] Perhaps

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[1007] *Journal Optical Society of America* 5: 291-307, 1921. See also "Sagnac effect: A century of Earth-rotated interferometers," by R. Anderson, *et al.*, Silberstein, unlike Einstein, had not dismissed the Sagnac experiment that occurred just eight years earlier. In any case, the preliminary experiment performed at Mt. Wilson used a mile-long circuit for the light path. The tests showed that

> The interference fringes…were observed most clearly during the half-hour before and after sunset. But even under the best conditions, the interference fringes were so unsteady that it was found impossible to make any reliable measurements.[1008]

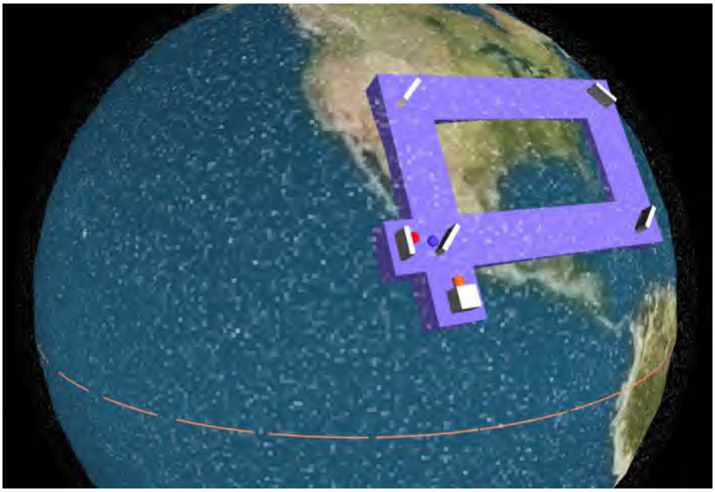
To eliminate the effects of air, Michelson and Gale reassembled the mile-long, one-foot-wide watermain pipe. The second abstract reads:

> Experimental Test of Theory: Air was exhausted from a twelve-inch pipe line laid on the surface of the ground in the form of a rectangle 2010 × 1113 feet. Light from a carbon arc was divided at one corner by a thinly coated mirror into direct and reflected beams, which were reflected around the rectangle by mirrors at the corners. The two beams returning to the original mirror produced interference fringes. The beam traversing the rectangle in a counter-clockwise direction was retarded. The observed displacement of the fringes was found to be 0.230 .005, agreeing with the computed value 0.236 .002 within the limits of experimental error.[1009]

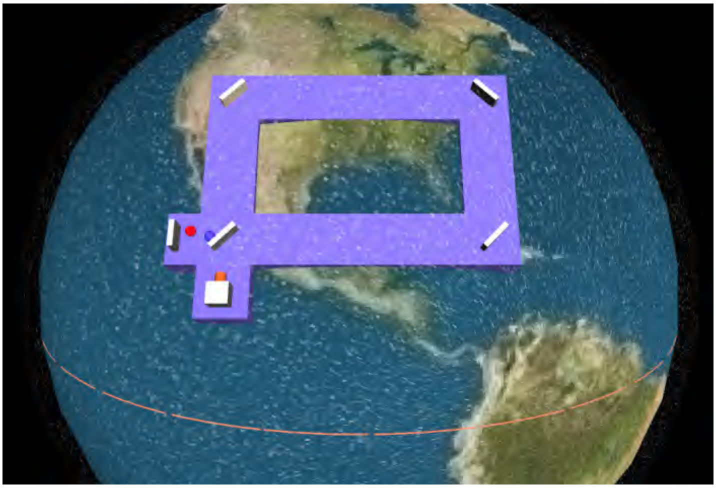
American Journal of Physics, 62(11), November 1994. He writes: "This motivation was suggested by Silberstein that relativistic or ether-theoretic frame dragging might affect the result, in that Eq. 1 ($\delta t = 4\Omega A/v^2$ & $\delta\varphi = 8\pi\Omega A/\lambda v$) might prove to be invalid for the action of the Earth rotation: the ether might be entrained by the rotation of the Earth but not by that of a small laboratory mass. Michelson therefore appears to deserve credit for the first prediction, if not the first demonstration, of the Sagnac effect….Michelson himself was not overly enthusiastic about his work with Gale; he embarked on it reluctantly in deference to the urgings of relativists such as Silberstein 'whose mathematical arguments he modestly professed he was unable to refute,' and subsequently caustically remarked that the experiment 'only shows that thye earth rotates on its axis.'" (p. 976).

[1008] "The Effect of the Earth's Rotation on the Velocity of Light," Part I, by A. A. Michelson. *The Astrophysical Journal*, April 1925, Vol .LXI, No. 3.

[1009] *Ibid.*, Part II.



Michelson-Gale experiment: Heliocentric view:
Earth rotates left to right producing difference in light's velocity[1010]



Michelson-Gale Experiment: Geocentric view: universe/ether rotates right to left producing difference in light's velocity.

[1010] See CDrom animation of the Michelson-Gale experiment.

The tests were made on thirteen different days with a total of 269 observations, almost always with the same results. The lowest value for the displacement in the fringes was 0.193 while the highest was 0.255 with the mean displacement coming in at 0.230. Thus, right before Michelson's own eyes, the 1913 Sagnac results were confirmed and his 1887 interpretation was put in question, as was Relativity. Here was further proof, to the order of ten times the power of the Sagnac experiment, that there is, indeed, an absolute space in which absolute rotation occurs. Something was affecting the light in order for it to consistently produce the fringe displacement. Sagnac (1913) and Michelson (1925) demonstrated it was ether, which was quite an irony for the latter. Although Michelson would sum up the experiment with the sardonic comment: "All we can deduce from this experiment is that the earth rotates on its axis,"[1011] in reality, the experiment did not distinguish between an Earth rotating against the ether as opposed to the ether circling around a fixed-Earth. In other words, it provided no proof that the Earth rotates, but opened the door very wide to suggest that Copernicus was wrong, since no translational motion corresponding to 30 km/sec was found by Michelson and Gale.

Analyzing the results of the Sagnac and Michelson-Gale experiments, Hayden and Whitney, in the revealing title: "If Sagnac, Why Not Michelson-Morley?" write:

> The logical existence of the incremental Sagnac effect implies… that there is some compelling physical reason why the effect cannot be observed at the surface of the Earth….We hold that until something new is brought to the table, this question simply cannot be resolved. No currently accepted theory reveals why, like a Cheshire cat, the Sagnac effect shows itself in one kind of experiment but not in another.[1012]

The authors are certainly correct in concluding, "until something new is brought to the table, this question simply cannot be resolved." The resolution staring them in the face but which has been "unthinkable" since the days of Lorentz and Einstein is that the Earth is not moving. Whereas Sagnac and Michelson-Gale, being themselves Copernicans, were testing for "The Effect of the Earth's Rotation on the Velocity of Light," the interpretation of their results in regard to a geocentric universe is, as we stated earlier, that Earth is motionless at the center of the universe. There is a slight movement of the ether against "the surface of the Earth" due to the rotation of the universe, which then shows up in miniscule fringe shifts in the interferometer experiments. Accordingly, since the Earth has no translational motion, experiments seeking to detect such motion will always come to a "null" result. The result, as we have seen, is not actually null; rather, all the experiments show a slight positive result (as did the original Michelson-Morley experiment in 1887), but the physicists and astronomers interpreting the results consider them null because they do not produce the *expected* fringe shifts if the Earth is understood to be moving through the ether by revolving around the sun at 18.5 miles/sec. In other words, if one presupposes a revolving and rotating Earth, the fringe shifts are always too small to account for such double motion. But if we assume a stationary Earth in the center of a universal ether, there will, indeed, be as slight a movement of the ether against Earth as there would be against a ship in the eye of a hurricane.

[1011] Quoted by A. H. Compton in an interview with Michelson's daughter Dorothy Michelson Livingston, as cited in *The Master of Light*, p. 310.

[1012] Howard C. Hayden and Cynthia K Whitney, "If Sagnac and Michelson-Gale Why Not Michelson-Morley?" *Galilean Electrodynamics*, vol. 1, no. 6, Tufts University, Nov./Dec. 1990, pp. 73-74.

Considering the unanswerable problems the Sagnac and Michelson-Gale experiments present to modern physics and cosmology, it is no surprise that both experiments are hardly mentioned, if at all, in the physics literature,[1013] and it is likewise no puzzle why Einstein makes no mention of these crucial experiments in any of his writings.[1014] Obviously, without at least Sagnac's results in hand, Einstein was on a wild goose chase. As noted above, it was left to Langevin to explain Sagnac, but he found it impossible to do.

[1013] Hayden and Whitney write: "More so than the original Sagnac experiment, the subsequent Michelson-Gale demonstration of the Sagnac effect is curiously neglected in the literature. R. D. Sard [*Relativistic Mechanics*, W. A. Benjamin, Inc., New York, 1970] comments only that the Michelson-Gale experiment determined the Earth's angular velocity to within 2.5%. L. S. Swenson ["Michelson and Measurement," *Physics Today* 40, 24, 1987] recently devoted only 22 words to the experiment, calling it 'an attempt at a large field in Clearing, Illinois, to measure the effect of the Earth's rotation on the velocity of light.' In 55 references, E. L. Hill ["Optics and Relativity Theory," *Handbook of Physics*, E. U. Condon, ed., McGraw Hill, 1967] does not list the Michelson-Gale experiment. In a list of some 1600 references, C. W. Misner, K. S. Thorne, and J. A. Wheeler [*Gravitation*, 1973] make no mention of Michelson-Gale [neither do they mention Sagnac]…Moreover, the Michelson-Gale paper is not mentioned in *any* of the famous papers which claim to measure the velocity of light, or to compare light speeds in various directions" ("If Sagnac and Michelson-Gale Why Not Michelson-Morley?" Howard C. Hayden and Cynthia K Whitney, Tufts University, Nov./Dec. 1990). Dean Turner, writing in 1979, points out that the 1971 *McGraw-Hill Encyclopedia of Science and Technology*, the 1974 *Encyclopedia Brittanica*; the 1976 *Encyclopedia Americana*, and the *Encyclopedia of Philosophy* of 1967 all fail to mention the Sagnac or Michelson-Gale experiments. McGraw-Hill consented to write an article on ether for the 1977 edition, but still failed to mention Sagnac and Michelson-Gale, two of the

As Tom Bethell relates it,

> Einstein knew of the experiment, and in fact discussed it with Michelson in Chicago in 1921. He admired the "ingenious" way he overcame the difficulty "that we are not able to change the direction of the Earth's rotation." The Earth could not be rotated back, to see if the interference fringes had shifted during its rotation. Michelson did this by adding a second, much smaller interference loop that served to produce a "fiducial mark from which to measure the displacement" in the larger circuit. The experiment demonstrated a small fringe shift, close to the predicted value. But the
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> Einsteinians were able to find an escape route, thereby protecting the special theory from falsification. SRT applies only to inertial reference frames, in which no unbalanced forces are allowed. But because Michelson-Gale depended on the Earth's rotation, centrifugal forces and curvilinear paths are inevitably present. Therefore it was non-inertial. A similar argument was used against the Sagnac experiment, in which the apparatus was rotated. The equations of special relativity cannot incorporate an acceleration even as small as the three thousandths of one-g

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most important experiments in the annals of physics (*The Einstein Myth*, pp. 44, 102).

[1014] Einstein's biographer, Ronald Clark, makes no mention of either the Sagnac or the Michelson-Gale experiment in the entire 878 pages of the book. He makes brief mention of Dayton Miller but only to downplay his results. Stephen Brush in "Why was Relativity Accepted?" (*Physics in Perspective* 1: 184-214, 1999), makes no mention of Sagnac, Michelson-Gale or Miller, but has at least a dozen references to Michelson-Morley. Bernard Jaffe cites Miller, but makes the erroneous conclusion: "…no shift in interference effect was observable," when, in fact, a shift was, indeed, observable (Bernard Jaffe, *Michelson and the Speed of Light*, p. 107). Also during this time came the experiment by Mixer in 1925, who used sunlight rather than artificial light in the interferometer (as had been suggested by both Tolman (*Physical Review* 35:136, 1912 and La Rosa (*Phys. Zeitschrift* 13:1129, 1912), but apparently with the same results. (See also Edmund Whittaker's *A History of the Theories of Ether and Electricity: The Classical Theories*, first edition 1910; revised 1951, Nelson and Sons, Ltd., London).

> experienced in Michelson Gale. But both the Sagnac and the Michelson-Gale results could be predicted using the complicated mathematics of general relativity. So the Einsteinians succeeded in turning the tables on their critics. Instead of falsifying special relativity, these two experiments were construed as having confirmed general relativity. Petr Beckmann pointed out how unsatisfactory this was. The big difference between the ether-based explanation of Michelson-Gale, and GRT was this: The classical explanation "follows from the Galilean principle of relativity in a few lines of high school algebra, whereas Einstein's general theory does it with multidimensional complex tensors in space-time and non-Euclidean geodesics." In an interview, John Hall raised the question whether any experiment done on the surface of the Earth can be considered truly inertial. All such experiments are all done on the "surface of a spinning ball," he said. Gravitational forces are inevitably present. So "if you turn up the sensitivity, it is completely sure that there is some effect," such as the fringe shift that Michelson eventually showed in Michelson-Gale, or (perhaps) that he himself had shown in Brillet-Hall but considered to be "spurious."[1015]

It is quite apparent that Relativists have made a practice of creating the proverbial moving target in order to keep the illusion of "Relativity" propped up in the public consensus. As they juggle one theory against the other, Special Relativity becomes virtually unfalsifiable because it can never apply to the real world, since the real world does not contain any inertial frames free of unbalanced forces. Consequently, Special Relativity exists only as a theoretical phantom to allow Einstein and his followers to escape the consequences of the experimental results. The question of why Special Relativity allows itself to be used for the angular motion of the Earth around the sun but not the angular motion of the Earth on its axis is certainly a glaring contradiction, especially since both angular motions must be considered non-inertial. Moreover, it is also contradictory for Special Relativity to use the Lorentz transform for the Earth's angular movement around the sun, but eliminate the Lorentz transform when analyzing the Earth's angular movement on its axis. But this is the nature of Relativity – even the theories are relative with respect to one another – and thus contradictions abound whenever they are present.

[1015] "Questioning Einstein: Is Relativity Necessary?," *Proceedings of the NPA*, Long Beach, California, 2010, p. 3.

The Interferometer Experiments of Dayton C. Miller

Next in this line of argumentation are the comprehensive results of **Dayton Miller's** interferometer experiments. As noted previously, although Einstein escaped direct confrontation with Sagnac's results, this was not the case with Miller. In addition to the previous quotes from Einstein we cited showing that Miller was hot on his trail, several more show how nervous Einstein became over Miller's undaunted quest. In a letter Einstein once wrote to Edwin E. Slosson, he states:

> My opinion about Miller's experiments is the following.... Should the positive result be confirmed, then the special theory of relativity and with it the general theory of relativity, in its current form, would be invalid....Only the equivalence of inertia and gravitation would remain, however, they would have to lead to a significantly different theory.[1016]

Miller's experiments, conducted over a period of 20 years, showed time and time again the same thing that Sagnac and Michelson-Gale had found – slight fringe shifts in the interferometer that indicated ether as the cause. In fact, Miller wasn't boasting of anything he had discovered; rather, he made it clear that he was acquiring the same positive results that Michelson-Morley obtained way back in 1887. As Arthur Lynch reveals:

> Dayton Miller, in a letter dated 4th October, 1930, says that 'It is true that nearly all the writers at the present time interpret the experiments as giving a definite null effect, and most of them assume that it is final. The truth of the matter is the experiment never gave a null effect. My present determinations are exactly in agreement with the 1887 results of Michelson and Morley. This fact has been widely announced especially in England, but the theory of relativity seems to be so acceptable to many persons that they overlook the apparent discrepancy.'[1017]

[1016] July 1925. As quoted from the paper by Dr. James DeMeo: "Dayton Miller's Ether-Drift Experiments: A Fresh Look," 2002. (NB: This book does not endorse any of the other theories of DeMeo, *e.g.*, his "orgone biophysical" research). Miller performed his experiments on the top of Mr. Wilson. Sadly, DeMeo reports: "Today, I am informed, there is no record of Miller's extensive work at Mt. Wilson, only a memorial plaque dedicated to Michelson and Einstein" (p. 12).

[1017] *The Case Against Einstein*, p. 45.

Dayton Clarence Miller (1866 – 1941)

Miller's experiments even went a little beyond Sagnac and Michelson-Gale. Whereas the latter discovered absolute motion by detecting differences in the speed of two light beams in the same medium, they were not designed to detect the actual drift of the medium against Earth. Miller's results showed that an ether drift was originating from the southern celestial hemisphere in the direction of the constellation Draco in the middle of the Great Magellanic Cloud.[1018] It wasn't as easy for Einstein to ignore Miller as to ignore Sagnac. Sagnac was a French physicist, and except for Paul Langevin noted earlier, most French scientists were ignoring or had outright rejected Relativity, until at least about 1950.[1019] Miller was an American. After Germany, the United States was the next country to fully embrace Relativity, and Einstein had already emigrated to the United States. Moreover, Miller earned his doctorate in science in 1890 from the prestigious Princeton University (the same institution at which Einstein would eventually have a professorship), as well as being president of both the American Physical Society (1925-1926) and Acoustical Society of America (1913-1933). He was chairman of the division of Physical Sciences of the National Research Council (1927-1930), and chairman of the physics department of Case School of Applied Science (aka: Case Western University). He was also an active member of the National Academy of Sciences. In short, Miller was a force with which to be reckoned. It is safe to say that, with his expertise Miller performed the most extensive and sophisticated interferometer experiments ever devised. He used the largest and most sensitive equipment to date. He floated the device on a pool of mercury to eliminate friction (at great expense), and used different bases: wood, metal and concrete. He did tests at different times of the day, different seasons of the year, different altitudes, different latitudes and with different light sources. He took precautions against thermal distortions by insulating the apparatus in one-inch cork and by applying uniform parabolic heaters and taking account of human body heat. He covered the interferometer in glass so that drift would not be inhibited. He used a 50 u magnification telescope to observe the fringes, which allowed him to see down to the hundredth scale. Miller even switched to an interferometer made of aluminum and brass to eliminate possible effects from magneto-constriction. Over all, he took over 200,000 different readings from 1902-1926. By contrast, the 1887 Michelson-Morley had a grand total of 36 readings on an apparatus that was much smaller and less accurate. It was covered in wood and situated in the basement of a large stone building, both of which limit the sensitivity since such insulated locations will shield much of the ether drift. And still, they managed to obtain a small positive result, as they themselves admitted. Thus, Einstein had a lot to worry about since, if Miller's result was correct, and it seemed so, by Einstein's own verbatim admission, Miller would

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[1018] The right ascension from Draco was 4 hours 54 minutes, with declination of – 70° 33', in the middle of the Great Magellanic Cloud and 7° from the southern pole of the ecliptic. Since Miller believed the Earth moved, he phrased his results in the language that the Earth was drifting toward Dorado rather than the ether drifting toward Draco. Because he believed the sun was revolving around the Milky Way and carrying the Earth, Miller concluded that the total ether drift should be 208 km/sec, but was only 10 km/sec at Earth because the ether was entrained at the Earth's surface ("The Ether-Drift Experiments at Mount Wilson Solar Observatory," *Physical Review*, 19:407-408, 1922). The fact remains that Miller had no way of distinguishing whether the Earth was moving toward Dorado or the ether was moving toward Draco against a fixed earth. His results in Cleveland showed a 3 km/sec drift, which was very close to what Michelson-Morley had found in 1887 in their basement facility. The contrast between the Cleveland and Mt. Wilson results shows that the closer the equipment is to the surface of the Earth, the less movement of ether against it. The science community (which was favoring Relativity) could tolerate Miller's 3 km/sec results, since those results correlated with Michelson-Morley and were already considered

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"null." But they did not like his 10 km/sec results, which he first obtained in 1921 using the same equipment that he and Morley had used in 1905. The same results were obtained again in 1922-1924 using controlled experiments.

[1019] See Brush, "Why Was Relativity Accepted?" p. 194. Langevin, not Einstein, was also responsible for inventing the twin paradox to explain Special Relativity (Cohen, *Revolution in Science*, p. 411).

totally destroy Relativity theory. The battle between Miller and Einstein went on for some years. Miller never conceded his findings, and Einstein never conceded that Miller was correct. Between 1921 and 1933, Miller, who had previously teamed up with Edward Morley in 1903 and 1904 in two separate interferometer experiments, performed over 100,000 trials. This was hardly a scientific force that Einstein could ignore.[1020]

Miller and Einstein were exchanging letters for a few years. So alarmed was Einstein by the results of Miller's experiments that he stated quite plainly to one of his colleagues: "If Michelson-Morley is wrong, then relativity is wrong."[1021] In a private letter to Robert J. Millikan, Einstein wrote:

> I believe that I have really found the relationship between gravitation and electricity, assuming that the Miller experiments are based on a fundamental error. Otherwise the whole relativity theory collapses like a house of cards.[1022]

A follow-up letter three months later stated: "Privately I do not believe in the accuracy of Miller's results, although I have no right to say this openly."[1023] But Einstein had said it openly enough that in 1926 a Cleveland newspaper picked up the story and wrote both the following headline: "Goes to Disprove Einstein Theory: Case Scientist Will Conduct Further Studies in Ether Drift: Einstein Discounts Experiments" and this subsequent article:

> Speaking before scientists at the University of Berlin, Einstein said the ether drift experiments at Cleveland showed zero results, while on Mount Wilson they showed positive results. Therefore, altitude influences results. In addition, temperature differences have provided a source of error. "The trouble with Prof. Einstein is that he knows nothing about my results," Dr. Miller said. "He

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[1020] D. C. Miller, "The Ether-Drift Experiment and the Determination of the Absolute Motion of the Earth," *Reviews of Modern Physics* 5, 352-367, 1933.

[1021] Stated to Sir Herbert Samuel in the grounds of Government House, Jerusalem (*Einstein: The Life and Times*, p. 107).

[1022] Letter to Robert Millikan, June 1921 (*Einstein: The Life and Times*, p. 400). Or as Einstein once said to astronomer Erwin Freundlich in 1913: "If the speed of light is in the least bit affected by the speed of the light source, then my whole theory of relativity and theory of gravity is false" (*ibid*., p. 207).

[1023] Letter to Robert Millikan, September 1921, *ibid*. Clark adds these words from Michael Polanyi: "Instead, as Sir Charles Darwin once described it, they sent Miller home to get his results right" (*Einstein, The Life and Times*, p. 400).

> has been saying for thirty years that the interferometer experiments in Cleveland showed negative results. We never said they gave negative results, and they did not in fact give negative results. He ought to give me credit for knowing that temperature differences would affect the results. He wrote to me in November suggesting this. I am not so simple as to make no allowance for temperature."[1024]

One of the interesting features of Miller's results is that they were calculated in relation to sidereal time, that is, against the displacement between a star and the Earth, as opposed to the sun and the Earth. The former time yields 23 hours, 56 minutes and 4.09 seconds; the latter 24 hours exactly.[1025] This shows that the ether is drifting in relation to the stars, and thus gives a more definitive picture of absolute motion.

But we must pause at this juncture to critique Miller's thinking process, for he, being a Copernican, is basing his interpretation of data on his belief that the Earth is moving at least 30 km/sec through space. Interestingly enough, it is precisely because of this presupposition that Miller runs into some unexplained difficulty, since his observations begin to conflict with his mathematical calculations. The one anomaly in all past interferometer experiments that Miller discovered was the experimenters *assumed* they knew the precise velocity of the Earth through the ether in combination with the solar system's supposed motion toward the constellation of Hercules, but did they really know? The geocentrist, of course, would answer that they *did not* know. In any case, Miller's 1925 experiment took into account this "anomaly" and he made his calculations accordingly. Since he assumed the Earth was moving 30 km/sec, he combined this with the four positions (February, April, August, September) that he examined of the Earth's orbit around the sun and then used Pythagorean geometry to determine the speed of the Earth toward the constellation Dorado, which came to 208 km/sec.[1026] In other words, 208 km/sec is what Miller believed to be the Earth's absolute speed through the ether. Of course, being a heliocentrist, Miller is assuming that the ether is motionless and that the Earth is moving through it. In any case, Miller's 1933 paper reveals that his Pythagorean calculations do not match what he observed in the fringe shifts. As we will recall, his experimental fringe shifts showed a maximum of 10 km/sec, but this figure is less than his computed value by a factor of twenty! Except for the possibility of entrained ether at the surface of the Earth, Miller did not have an answer for this problem, and it is left as an open-ended question in his 1933 paper. The answer, of course, is that Miller's Pythagorean calculations were based on a faulty premise (*i.e.*, that the Earth was moving). If that factor were eliminated, his calculations would be in accord with his observations. The same can be said of recent experiments performed by Stefan Marinov, in the late 1970s, using coupled-mirror interferometry.[1027] If, on the other

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[1024] The Cleveland *Plain Dealer*, 27 Jan. 1926. In 1930, *Scientific American* remarked on the issue: "Let a world of blind admirers and enraged detesters of a theory beat the air with super-heated syllables, Einstein serenely smokes his pipe and says 'If Professor Miller's research is confirmed, my theory falls, that's all.' And Miller, standing before his assembled peers in science, is almost apologetic about his findings, but indicates that "there there are" (March 1930). Einstein wrote this article for *Scientific American* for the April 1950 issue.

[1025] In the same way, in sidereal time (*i.e.*, star time), the moon travels around the Earth in 27.33 days, as opposed to 28-29 days as measured only from Earth.

[1026] Miller configured the four interferometer readings in the form of a parallelogram (February, April, August, September), which assumes the Earth is

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in orbit around the sun. The diagonal of each of the four parallelogram points represents the apex of that period, while the long side represents the motion, which is coincident with the center of orbit; the short side of the parallelogram represents Earth velocity of 30 km/sec. Hence, knowing the direction of the three sides of the triangle, and the magnitude of one side, allows one to calculate the magnitude of the other sides, which for Miller was 208 km/sec toward Dorado. (See also Laurence Hetch in *21st Century – Science and Technology*, Spring 1988, pp. 47-48).

[1027] Stephan Marinov, whose experiments show an ether-drift of 279-327 km/sec, declares that the Earth is moving through it toward the midpoint of the constellations Virgo, Hydra and Libra (J. P. Wesley, *Galilean Electrodynamics*, "In Memorium: Stefan Marinov, Spring 1999, pp. 11-12; S. Marinov, *General Relativity and Gravity* 12, 57, 1980b). Also *Czechoslovakia Journal of Physics* B24:965, 1974, and *Eppur Si Muove* (Brussels: CBDS-Pierre Libert, 1977, pp. 101-111, the latter cited in Bouw, *Geocentricity*, p. 257). Obviously, Marinov's calculations are close to those of Dayton Miller's 1925 interferometer experiments, but as Miller had, he used heliocentric geometry in arriving at his 300+ km/sec. E. W. Silvertooth, after having had "null" results in 1972 with frequency-doubling crystals (*Journal of the Optical Society of America*, 62:1330), had similar results to Marinov in a 1983 experiment. He claims that laser-interferometer experiments analogous to the Michelson-Morley apparatus give a null result because frequencies of the interfering beams are dependent upon velocity relative to a stationary frame. Hence, the frequency adjusts precisely enough to cancel any effects due to the motion through the light's reference frame, and a null result is the inevitable consequence. This, claim, of course, assumes that the "velocity" is caused by an Earth moving at 30 km/sec and that light has its own "reference frame." Another study performed by Smoot, Gorenstein and Muller also sought to find motion of the Earth (*Physical Review Letters*, 39, 898, 1977). As reported by Michael Rowan-Robinson, the quest was to find a "dipole anisotropy of order 10^{-4} to 10^{-3}…due to the random motions that galaxies have hand, Miller's and Marinov's calculations of 200 to 300 km/sec are correct, this does not prove the Earth is moving through it. As Bouw notes: "Every center of revolutionary motion, such as the sun, the Milky Way, or a cluster of galaxies, each introduces another motion of the aether sweeping past the earth."[1028] In other words, if ether dragged by the movement of the sun is added to ether dragged by the movement of the Milky Way and other galaxies so that the sum is 200 to 300 km/sec of

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with respect to each other and to the cosmological frame of reference. The radiation should look slightly hotter in the direction we are traveling towards, and slightly colder in the direction we are traveling from, by an amount $\Delta T/T \approx v/c$, due to the Doppler shift." This study was important to them because "Failure to detect this effect would put us in the uncomfortable position of happening to be exactly at rest with respect to the cosmological frame." In other words, it would show the Earth at the center and immobile in space. Although the Smoot team, similar to the Rubin team, found an anisotropy, it made little sense and did not get them out of the "uncomfortable position." As Rowan-Robinson reveals, "the magnitude of the velocity deduced for the Milky Way, 600 km/sec, is so large as to throw existing ideas about our cosmic environment into disarray." In addition, "The authors note that the velocity they have found conflicts with various attempts to measure our velocity with respect to nearby galaxies, but offer no explanation of this. With respect to the Local Group of galaxies, the motion of the Solar System hardly differs from that expected due to our circular motion round the Galaxy. This suggests that the whole Local Group has to be moving along together at this velocity of 600 km/sec with respect to the microwave background" (Michael Rowan-Robinson, "Ether drift detected at last," *Nature*, Vol. 270, November 3, 1977, p. 9). We note here that the Smoot team did not find a velocity of the Earth, but only a velocity of the solar system and the Local group. Reginald T. Cahill reports that at least seven experiments have detected a translational velocity; some with gas-mode interferometers and others with coaxial cable (DeWitte 1991), with a result of around 430 km/sec (R. T. Cahill, "Quantum Foam, Gravity and Gravitational Waves," *Relativity, Gravitation, Cosmology*, eds. V. V. Dvoeglazov and A. A. Espinoza, New York: Nova Science Publication, 2004, pp. 168-226; R. T. Cahill, "Absolute Motion and Gravitational Effects," *Apeiron*, 11, No. 1, 2004, pp. 53-111). In another paper Cahill writes: "Physics has been in an era of extreme censorship for a considerable time; Miller was attacked for his major discovery of absolute linear motion in the 1920's, while DeWitte was never permitted to report the data from his beautiful 1991 coaxial cable experiments. Amazingly these experimenters were unknown to each other, yet their data is in perfect agreement….All discussions of the experimental detections of absolute motion over the last 100 years are now banned from the mainstream physics publications" (Reginald T. Cahill, *The Einstein Postulates: 1905-2005: A Critical Review of the Evidence*, Flinders University, Adelaide, Australia, December 7, 2004).

[1028] G. Bouw, *Geocentricity*, p. 258.

ether moving past a fixed Earth, the higher alternative readings offer no escape from the geocentric system.

A more extensive analysis of Miller's results indicates an amazing correlation with alignment of the Cosmic Microwave Background Radiation (CMB) and the universal ether flow. Miller found the following variations by season in his ether flows:

February (early)	9.8 kps
April (early)	10.1 kps
June (early)	maxima
August (early)	11.2 kps
September (mid)	9.6 kps
December (early)	minima

This shows an apparent fluctuation based on the sun's position with respect to the northern hemisphere where Miller performed the experiments. The ether drift is at its maximum (app. 11 kps) when the sun is at the maximum latitude of its 47° annual ecliptic movement, and the ether drift is at its minimum (app. 9) when the sun is at the minimum of its 47° annual ecliptic (23.5° in the northern hemisphere and 23.5° in the southern). As is apparent by the figures, the ether drift also varies between the maximum and minimum by a proportion commensurate with the remaining positions of the sun. In other words, the farther away the sun is (or the steeper the angle) from Miller's apparatus, the less the ether drift speed.

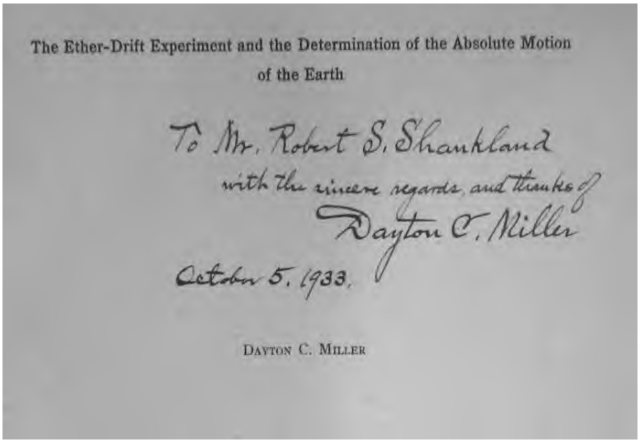
There also exists a direct relationship between the maxima and minima velocity and the vector motion of the averaged data. The velocities oscillate around a geographic vector of 23.75° East. Within the margin of error, it can be safely said that Miller's results precisely coincide with the ecliptic plane of the Earth at 23.50° toward the East. The next interesting fact is that the CMB quadrupole and octupole are aligned precisely with the 23.5° ecliptic, while the CMB dipole is aligned with the Earth's equator at 0 degrees. This is precisely what we would expect in a geocentric universe. As the CMB radiation, with the ether, rotates around a fixed Earth on an annual basis, Miller finds an average ether drift aligned almost precisely with 23.5° ecliptic bearing "East," and the CMB quadrupole and octupole show the same annual alignment with the 23.5° ecliptic. In effect, the CMB anisotropy and the Miller ether drift are caused by the same mechanical structure – the rotation of the universe within the 23.5° ecliptic around the Earth. This only leaves to explain why Miller found a fluctuation of ether drift between 9 and 11 kps. That is apparently explained by the fact that the sun lags behind 4 minutes per day to form the ecliptic plane, and as it does so its velocity round the Earth and its radiation affect the velocity of ether drift going toward Earth as sure as sun spots affect Earth's electro-magnetic fields.

Shankland Dismisses Millers Findings

A number of years after Miller's death in 1941 his experimental results were formally addressed. Perhaps not being able to dismiss Miller's haunting words, in 1954, a year before his own death, Einstein employed the services of Robert S. Shankland to investigate Miller's findings. The notes reveal that the two men had "extensive consultations" about Miller. Ironically, Shankland was one of Miller's students for many years, and only began to favor Einstein's Relativity after Miller died. His career soared after he decided to declare Miller's work worthless. He also accused Miller of indirectly prohibiting Einstein from receiving the Nobel Prize for Relativity.

Perhaps another irony is that Shankland's report on Miller was published in 1955, in the same month and year of Einstein's death.[1029] It was full of misrepresentations as well as appeals to criticisms that had already been thoroughly addressed years earlier. He searched for and emphasized the random errors in Miller's data (which every experiment has) and selected only certain data sheets to examine – those in which Miller used a parabolic heater.

[1029] "R. S. Shankland, S. W. McCuskey, F. C. Leone and G. Kuerit, "Analysis of the Interferometer Observations of Dayton C. Miller," *Reviews of Modern Physics*, 27(2):167-178, April, 1955. Shankland writes, "…variations of only 0.001 [degree Celsius] in the air of the optical arms would produce fringe shifts as large as the average effects produced at Mt. Wilson.…In what follows, we…must admit that a direct and general quantitative correlation between amplitude and phase of the observed second harmonic on the one hand and the thermal conditions in the observation hut on the other hand could not be established" (p. 175). As Bouw notes: "In other words, they couldn't prove that a temperature difference across the arms was responsible for Miller's results. The evidence presented by Shankland and co-workers appears to be consistent and convincing; but Miller was well aware of the effects of temperature on his experiment and, in fact, had thermometers along the arms for just such a check" (*Geocentricity*, p. 249).



The Ether-Drift Experiment and the Determination of the Absolute Motion
of the Earth

To Mr. Robert S. Shankland
with the sincere regards and thanks of
Dayton C. Miller
October 5, 1933.

Dayton C. Miller

Letter from Dayton Miller to Robert Shankland, 1933

Since Miller himself noted in preliminary trials that heat added to the fringe shifts,[1030] Shankland's team seized on these control experiments and used them against Miller, declaring that they "might" have affected his overall results. As DeMeo reports:

> …the Shankland team…selected only those data sets which appeared to support their argument of a claimed thermal anomaly…leaving one to wonder if the unselected and excluded data, which constituted the overwhelming majority of it, simply could not provide support for their criticisms….For the casual

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[1030] Miller wrote: "Inequalities in the temperature of the room caused a slow, but steady, drifting of the fringe system to one side, but caused no periodic displacements….When the heaters were directed to the air in the light-path which had a covering of glass, a periodic effect could be obtained only when the glass was partly covered with opaque material in a very nonsymmetrical manner….These experiments proved that under the conditions of actual observation, the periodic displacements could not possibly be produced by temperature effects" ("The Ether-Drift Experiment and the Determination of the Absolute Motion of the Earth," *Reviews of Modern Physics*, vol. 5 (2), July 1933, p. 220). Unfortunately, historians such as Gerald Holton, otherwise very thorough in their research, turn a blind eye to certain results – as does Holton toward Shankland's miscues. Holton writes: "Again, on 14 March 1926, in a letter to A. Piccard, Einstein wrote, 'I believe that in the case of Miller, the whole spook is caused by temperature influences (air).' As it turned out, Einstein's intuitive response was right" (*Thematic Origins of Scientific Thought*, p. 335). This is not surprising to find in Holton's treatise on Einstein, since he rarely, if ever, faults Einstein with any bad motives or faulty reasoning.

> reader, who had not undertaken a careful review of Miller's original experiments, the Shankland paper might appear to make a reasoned argument. However, the Shankland paper basically obfuscated and concealed from the reader most of the central facts about what Miller actually did, and in any case was so unsystematic and biased in its approach, excluding from discussion perhaps 90% or more of Miller's extensive Mt. Wilson data, as to render its conclusions meaningless…. From all the above, it appears the Shankland group, with some degree of consultation with Einstein, decided that "Miller must be wrong" and then set about to see what they could find in his archive that would support that conclusion — which is not a scientific method.[1031]

[1031] "Dayton Miller's Ether-Drift Experiments: A Fresh Look," pp. 23-25. DeMeo provides excruciating detail and expert commentary on the Shankland review of Miller's work. He concludes: "My review of this important but sad chapter in the history of science left me both astonished and frustrated. Miller's works on ether drift was clearly undertaken with more precision, care and diligence than any other researcher who took up the question, including Michelson, and yet, his work has basically been written out of the history of science. When alive, Miller responded concisely to his critics, and demonstrated the ether-drift phenomenon with increasing precision over the years. He constantly pointed out to his critics the specific reasons why he was getting larger positive results, while others got only small results, or no results. Michelson and a few others of the period took Miller's work seriously, but Einstein and his followers appeared to view Miller only as a threat, something to be 'explained away' as expeditiously as possible. Einstein in fact was catapulted into the public eye following the end of World War II. Nuclear physics was then viewed as heroic, and Einstein fast became a cultural icon whose work could not be criticized. Into this situation came the Shankland team, with the apparent mission to nail the lid down on Miller's coffin. The Shankland conclusions against Miller were clearly negative, but the one systematic statistical analysis of his Mt. Wilson data merely confirmed what Miller said all along, that there was a clear and systematic periodic effect in the interferometer data. The Shankland paper also confirmed Miller's contention that this periodic effect was *not the product of random errors or mechanical effects.* The Shankland team subsequently searched for temperature artifacts in Miller's data, but failed to undertake any systematic analysis of his centrally-important Mt. Wilson data in this regard. Instead, they made a biased selection of a few published and unpublished data sets obtained from different periods in Miller's research, from different experimental locations, including [those] from his control experiments at Case School…Miller's most conclusive 1925-26 Mt. Wilson experiments encompassed a total of 6,402 turns of the interferometer, recorded on over 300 individual data sheets. That was the data the Shankland team should have been focused upon and evaluated systematically. Instead, only a few of

Miller, himself, addressed these concerns as any honest scientist would. In a 1926 paper he wrote the following concerning his own careful methodology:

> It is exactly for answering these questions and others, that the experiments have been continued over a period of six years, in which time thousands of readings have been made. Every disturbing cause that could be thought of has been exhaustively studied; among these are: daily and annual variations in temperature, meteorological conditions, radiant heat, magnetism,

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Miller's data sheets from these most centrally-important experiments were selected — certainly less than 10% of the data available to them was brought into discussion — and then only after being firstly dissected to extract only those data which could most easily be misconstrued as evidence for presumed temperature anomalies. For certain, some of the data held up for public critique came from Miller's control experiments at Case, or possibly from trial runs when technical 'bugs' were being worked out in the apparatus and building. Miller is no longer alive to inform us about his data, but the Shankland team willy-nilly lumped together both published and unpublished data, without comment….The Shankland group undertook no new experiments of their own, neither on the question of ether-drift, nor on the subject of thermal perturbations of light-beam interferometry — they made essentially an 'armchair analysis' of Miller's data. Only *some* of Miller's original data was carefully selected to make a rather unbelievable claim that small natural ambient temperature gradients in Miller's Mt. Wilson observation hut *might* produce fringe shifts in the insulated interferometer similar to what Miller himself previously observed in his control experiments using strong radiant heaters. The Shankland paper argued there *must have been* 'thermal effects' in Miller's Mt. Wilson measurements, but provides no direct evidence of this. *At no time did the Shankland group present evidence that temperature was a factor in creating the periodic sidereal fringe shifts observed by Miller in his published data, even though this was their stated conclusion.* In fact, they presented evidence from Miller's own lab notebooks which implied thermal gradients in the Mt. Wilson interferometer house would have been *below the observational limits* of the insulated apparatus….The fact that the present-day situation is totally [the] opposite of my example is a testament to the intensely political nature of modern science, and how major theories often develop into *belief-systems*, which demand the automatic suppression of any new finding which might undermine the faith and 'popular wisdom' of politically-dominant groups of academics. And that 'wisdom' today is: *Space is empty and immobile, and the universe is dead.* I submit, these are unproven, and even *disproven* assertions, challenged in large measure by Dayton Miller's exceptional work on the ether drift." NB: we emphasize here that, although DeMeo may have his own biased reasons for bringing the Shankland/Miller controversy to light (*e.g.*, his work with Orgone Labs), nevertheless, the facts of the case remain what they are.

> magnetostriction, differential gravitation, gyrostatic action, influence of method of illumination, transparent and opaque coverings of the light path, speed and direction of rotation [of the apparatus], lack of balance in rotating parts [of the interferometer], position of the observer, and other conditions. One after another, these disturbances have been shown not to produce the observed effects….The solution is entirely consistent with the observations of Michelson and Morley of 1887, and those of Morley and Miller of 1902-1906….The reported effect has always been present; it is clearly shown to be directly related to sidereal time, that is, to a cosmic cause.
>
> In making the observations, two independent quantities are noted, the direction in which the interferometer points when the effect is maximum, and the amount of periodic displacement of the interference fringes. Each of these two sets of readings leads to an independent determination of the right ascension and declination of the apex of the supposed motion of the earth in space. It is very significant that these two determinations are wholly concordant.[1032]

The only redeeming quality of the Shankland report is that within its own pages it registered some reserve regarding its own conclusions. As Consoli and Costanzo report:

> Within the paper the same authors [the Shankland team] say that "there can be little doubt that statistical fluctuations alone cannot account for the periodic fringe shifts observed by Miller." In fact, although "there is obviously considerable scatter in the data at each azimuth position…the average values…show a marked second harmonic effect."[1033]

Added to this is the Shankland team's admitted failure to establish a direct link between the appearance of second harmonic effects and thermal conditions. Consoli and Costanzo cite these words from the Shankland report:

[1032] Dayton C. Miller, *Nature*, 117:890, 1926.

[1033] M. Consoli and E. Costanzo, "The Motion of the Solar System and the Michelson-Morley Experiment," Istituto Nazionale di Fisica Nucleare, Sezione di Catania Dipartimento di Fisica e Astronomia dell' Università di Catania, November 26, 2003, p. 9, citing R. S. Shankland, et al., *Review of Modern Physics*, 27, 167, 1955, p. 171.

> "…we must admit that a direct and general quantitative correlation between amplitude and phase of the observed second harmonic on the one hand and the thermal conditions in the observation hut on the other hand could not be established."[1034]

Perhaps the Shankland team admitted to these facts in order to save themselves from any accusations of bias, but it is unfortunate that the admissions were completely overwhelmed by their general dismissal of Miller's results. In any case, we only wish that Shankland had been as critical of the original Michelson-Morley experiment, or the dozens of others that supposedly found a "null" result in the interferometers. But not only did Shankland claim that the 1887 Michelson-Morley experiment had a "null" result, he asserted that all other such experiments yielded a null result. This simply was not true, as we have clearly seen in the case of Sagnac and Michelson-Gale, and others that will come to light.

Nevertheless, a preliminary report was sent to Einstein in August 1954, upon which Einstein replied with the following letter:

> I thank you very much for sending me your careful study about the Miller experiments. Those experiments, conducted with so much care, merit, of course, a very careful statistical investigation. This is more so as the existence of a not trivial positive effect would affect very deeply the fundament of theoretical physics as it is presently accepted. You have shown convincingly that the observed effect is outside the range of accidental deviations and must, therefore, have a systematic cause [having] nothing to do with 'ether wind,' but with differences of temperature of the air traversed by the two light bundles which produce the bands of interference.[1035]

[1034] M. Consoli and E. Costanzo, "The Motion of the Solar System and the Michelson-Morley Experiment," Istituto Nazionale di Fisica Nucleare, Sezione di Catania Dipartimento di Fisica e Astronomia dell' Università di Catania, November 26, 2003, p. 9, citing R. S. Shankland, et al., *Review of Modern Physics*, 27, 167 (1955), p. 171, p. 175. Consoli and Costanzo compute the second harmonic component of the Michelson-Morley experiment to be: July 8, noon: 0.010 ± 0.005; July 9, noon: 0.015 ± 0.005; July 11, noon: 0.025 ± 0.005; July 8, evening: 0.014 ± 0.005; July 9, evening: 0.011 ± 0.005; July 12, evening: 0.018 ± 0.005 (*op cit.,* p. 15).

[1035] Robert Shankland, "Conversations with Albert Einstein II," *American Journal of Physics*, 41:895-901, July 1973. Cited in DeMeo, p. 3. Recently, Nobel laureate Maurice Allais has done extensive study of Miller's results, and has concluded in his abstract: "It is utterly impossible to consider that the regularities displayed in

We can see in the words "a not trivial positive effect would affect very deeply the fundament of theoretical physics as it is presently accepted" precisely the same sentiment that Einstein voiced to Herbert Samuel a few years earlier: "If Michelson-Morley is wrong, then relativity is wrong."[1036] A "trivial positive effect" was just what Miller found, but as we have seen above, all the other interferometer experiments, including Michelson-Morley, showed the same trivial positive results. As noted in his quote above, Miller claimed nothing more than what Michelson-Morley's results already indicated.

Other evidence related to Shankland shows that Einstein was doing his best to ignore or even stifle experiments designed to show the same positive results as Michelson-Morley. In an interview Shankland arranged with Einstein in 1952, he asked Einstein about the recently published paper on Relativity by J. L. Synge who predicted a small positive effect in a Michelson-Morley-type experiment. Shankland reports:

> Einstein stated strongly that he felt Synge's approach could have no significance. He felt that even if Synge devised an experiment and found a positive result, this would be completely irrelevant….[Later] he again said that more experiments were not necessary, and results such as Synge might find would be 'irrelevant,' He told me not to do any experiments of this kind.[1037]

Miller's interferometric observations can be explained by temperature effects. As a result the light velocity is not invariant whatever its direction and consequently the principle of invariance of light velocity on which fundamentally does rest the special theory of relativity is invalidated by the observation data." Allais adds: "Shankland's and et al's conclusions on the temperature effects are based on shaky hypotheses and reasonings. They are totally unfounded" (L'origine des régularités constatés dans les observations interférométriques de Dayton C. Miller (1925-1926): variations de température ou anisotropie de l'espace," C. R. Academy of Science, Paris, t. 1, Sèrie IV, p. 1205-1210, 2000, translated from the French, p. 1205). In addition to Allais, Reginald T. Cahill points out that the non-interferometer coaxial cable experiments of DeWitte (1991) and Torr and Kolen (1984) show results of motion equal to Miller's 1925 data. In the midst of analyzing the results Cahill concludes: "So the effect is certainly cosmological and not associated with any daily thermal effects, which in any case would be very small as the cable is buried" (Novel Gravity Probe B Gravitational Wave Detection, Flinders University, August 21, 2004, pp. 16-17).

[1036] *Einstein: The Life and Times*, p. 107.

[1037] R. S. Shankland, "Conversations with Albert Einstein," *American Journal of Physics*, 31:47-57, 1963, pp. 53-54, cited in *Thematic Origins of Scientific Thought*, p. 366. Holton says that "an experiment along these lines was devised

The only thing Miller did was confirm the "trivial" results of Michelson-Morley by doing over 100,000 trials in contrast to the 36 trials by Michelson-Morley, and by showing from which direction the ether drift originated. The fact that Einstein thought Miller's results denied his Relativity theory but that Michelson-Morley's results supported it, tells us that something was seriously wrong with either the information being disseminated about the interferometer experiments, or, more likely, that scientists were so biased in interpreting those results in their presumed favor (*i.e.*, as "null" results), that the whole world was convinced by some strange pixie dust that what was actually black was now white. Men do such things when the evidence gets uncomfortably close to revealing the truth about the cosmos as it really is, and as the Bible itself predicts. The Psalmist tells us that "the heavens declare the glory of God, and the firmament shows his handiwork" but modern science systematically suppresses it. As St. Paul says, "…the unrighteousness of men *who suppress the truth*…because that which is known about God is evident among them, for God made it evident to them."[1038] It is the same kind of suppression we saw with Edwin Hubble and Stephen Hawking who, after seeing evidence that Earth was in the center of the universe, declared it "intolerable" and concocted other theories to explain it away, feigning humility in the process. At the least, the world should have been told that there was a significant possibility that the Earth wasn't moving. That would have been a fair and scientific way of handling the evidence. In fact, acquiescing to Miller would have allowed science to opt for a moving Earth against a stationary ether as at least one of the possible solutions of his experimental results, for that is what Miller himself surely proposed.[1039] But modern physics was so bent on protecting Einstein that

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later and gave a null result, as Einstein had predicted," but he gives no reference to any such experiment and thus we do not know what Holton understands as "null," considering that Synge claimed to predict "a small positive effect," which is precisely what Miller's experiments found, and what the original Michelson-Morley experiment found (5 km/sec, not 0).

[1038] First quote is from Psalm 19:1 [18:1], the second from Romans 1:18-19, author's translation.

[1039] As we noted earlier, however, Miller's results did not prove that the Earth was moving through ether, since the equally viable explanation is that the ether is moving against the motionless Earth due to the rotation of the universe, which carries the ether around Earth. Miller would have no way to prove which was correct. Miller claimed that, due to the combined movement of the sun and the Earth, the drifts accumulative effect was to make the Earth drift, in the final analysis, toward the southern hemisphere rather than equatorially. In the geocentric system, the precession or wobble of the universe's movement will likewise not allow a mere equatorial-based drift, at least during most of the year.

they couldn't see the forest for the trees. As a result, they perpetuated a misinterpretation of Michelson-Morley to save themselves, so they thought, from having to reveal the news that the Earth is not moving at all. That news, of course, would have been almost as devastating to mankind as the return of Christ himself at the end of the world, for surely it would have been the death-knell to the runaway train of pseudo-intellectualism that pervades the modern age.

Interestingly enough, Miller's evidence against Einstein was corroborated from an unlikely source, Albert Michelson himself. In 1926-1929, Michelson, with Francis Pease and Fred Pearson, made several attempts at repeating the 1887 Michelson-Morley experiment. Perhaps the results of the 1925 experiment that Michelson performed with Henry Gale a year earlier were too perplexing for him since, as we noted earlier, it produced the same positive results that Michelson should have recognized in 1887. Their 1929 paper, "Repetition of the Michelson-Morley Experiment," reported on three attempts to produce fringe shifts, using light-beam interferometry similar to that originally employed in the Michelson-Morley experiments. The first experiment, which used the same

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In fact, we can predict that the ether drift should change direction depending on where the universe is in its annual precession. Miller's data correlates with this. During the latter stages of his experimental career, 1925 gave him the most optimal equipment and conditions to make his tests. In that year, Miller made four tests at four different times of the year. Each instance showed a different angle of displacement: February 8 was 10 degrees west, April 1 was 40 degrees east, August 1 was 10 degrees east, and September 15 was 55 degrees east. Here we see, for example, that between the sixth month interval of February 8 and August 1, the angle of displacement was precisely opposite (*i.e.*, 10 degrees west versus 10 degrees east), showing the same difference as we see between the Earth's axis and Polaris in six-month intervals. In viewing Miller's hodographs of the ether drift, superimposing the universe on the hodograph, one can readily see how it oscillates back and forth twice per year. Hence it is no coincidence that the mean displacement of Miller's four months of figures is 23.75 degrees east of north which, in the geocentric system, equates with the precessional tilt of the universe, and in the heliocentric system with the tilt of the Earth's axis at 23.5 degrees. Bouw adds that "Miller's results were quite consistent but not at all what was expected from theory. For example, Miller consistently obtained a result of two km/sec for the interferometer's motion at Case Institute of Technology (Cleveland, Ohio), but he got a result of three km/sec in the hills surrounding Cleveland. On the other hand, he consistently obtained ten km/sec at Mount Wilson (Los Angeles, California). In each case the error or uncertainty in his observations amounted to about a half km/sec," referencing L. Silberstein, *Nature*, 115:798, 1925 and Dayton Miller, *Nature*, 116:499, 1925 (*Geocentricity*, pp. 248-49, 364).

22-meter light path as the original Michelson-Morley experiment, predicted a fringe shift of 0.017 but stated "no displacement of this order was observed." The second experiment in 1927 used a 32-meter light path and again stated: "no displacement of the order anticipated was obtained." Here we notice that, rather than report that he obtained a small positive result, Michelson obfuscates his results and claims only that they didn't produce what was "anticipated." On what he based his "anticipated" results is not stated, but perhaps it was what he learned from the Michelson-Gale experiment just a couple of years earlier.

A third experiment performed in 1928 was moved to a "well-sheltered basement room of the Mount Wilson laboratory," and this time the light path was increased to 52 meters, more than double the original 1887 experiment. This higher altitude and longer light-path came closer to Miller's specifications. Thus, it is no surprise that, in this third try, Michelson indeed found significant fringe shifting, obviously because he finally learned to use better equipment. The more accurate equipment, however, brought out Michelson's bias toward replicating the exact results of his 1887 experiment, since he makes a concerted effort to downplay the results of this third and final experiment. Perhaps Michelson, now that his name was a household word among physicists, realized how much the world depended on verifying his 1887 "null" results to save Relativity from the jaws of defeat. Even his daughter, Dorothy Michelson Livingston, knew what was at stake for the Albert Michelson legacy. Concerning Dayton Miller's positive interferometer results she adds this bit of misplaced sarcasm: "Miller might have been wiser to have concentrated on his valuable research in acoustics and the exquisite tone of his flutes."[1040]

Regarding his interpretation of the 1928 experiments, Michelson downplays them with these words:

> The results gave no displacement as great as one-fifteenth of that to be expected on the supposition of an effect due to a motion of the solar system of three hundred kilometers per second. These results are differences between the displacements observed at maximum and minimum at sidereal times, the directions corresponding to… calculations of the supposed velocity of the solar system. A supplementary series of observations made in directions half-way between gave similar results.[1041]

[1040] *The Master of Light: A Biography of Albert A. Michelson*, p. 315.

[1041] "Repetition of the Michelson-Morley Experiment," *Nature*, 123:88, 19 Jan. 1929; and in *Journal of the Optical Society of America*, 18:181, 1929, cited in DeMeo, p. 17.

We see that Michelson did the same thing with his results that we saw Kennedy and Thorndike do with their results: contrast them to the presumed high velocities of celestial bodies in order to make the interferometer results look smaller. In the case of Kennedy-Thorndike, the nebulae [the term for galaxies in those days] were the contrast, whereas with Michelson-Pease-Pearson it is the solar system. There is a certain irony in this, since it is the heliocentric system that these men held as a fact that led them to hypothesize the high velocities of the nebulae and solar system in the first place.[1042] In any case, Kennedy-Thorndike found a value of "10   10 km per sec" for the ether's resistance against the Earth. Lo and behold, Michelson found the same thing since, if one multiplies his "three hundred kilometers per second" by "one-fifteenth," the result is 20 km/sec, which is precisely within Kennedy-Thorndike's margin of error.[1043]

Of course, none of this was a surprise to Miller. In commenting on Michelson's results, the unassuming Miller only wished his colleague had been a little more astute and not done his experiment in a basement. He writes:

> If the question of an entrained ether is involved in the investigation, it would seem that such massive and opaque shielding is not justifiable. The experiment is designed to detect a very minute effect on the velocity of light, to be impressed upon the light through the ether itself, and it would seem to be essential that there should be the least possible obstruction between the free ether and the light path in the interferometer.[1044]

Since Miller is not at all reluctant to point out precisely what Michelson-Pease-Pearson had demonstrated in their last ditch efforts to support Relativity theory, namely, that "The experiment is designed to detect a very minute effect on the velocity of light," this brings us back to the statement that Einstein made to Sir Herbert Samuel in Jerusalem: "If

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[1042] In the geocentric system, the celestial bodies are not traveling at high velocities since, as they are embedded in the universal ether, it is the ether that does the rotating around the Earth, with only slight independent movement of the celestial bodies within the ether. It is precisely the rotation of the ether every 24 hours that accounts for the small positive results of all the interferometer experiments at the surface of the Earth.

[1043] Some commentaries say the multiplier was one-fiftieth, not one-fifteenth, but the former appears to be in error.

[1044] "The Ether-Drift Experiment and the Determination of the Absolute Motion of the Earth," *Reviews of Modern Physics*, vol. 5 (2), pp. 203-242, July 1933, DeMeo, p. 18.

Michelson-Morley is wrong, then relativity is wrong."[1045] The irony of the whole thing is that it was Albert Michelson himself who proved that Michelson-Morley was wrong. In fact, Michelson proved this in two ways. The first was by the Michelson-Gale experiment in 1925 that measured the same absolute motion that Sagnac discovered in 1913; the second, by the Michelson-Pease-Pearson experiment which showed an ether drift against the Earth, and that the speed of light was affected by it. But since he was too blinded by whatever was prohibiting him from telling the whole truth, Michelson went to his grave thinking he had been successful, and so did the rest of the world. Michelson's work was buried along with him.

Recent Ether-Drift Experiments Showing Positive Results

One of the most detailed and well-reasoned reports concerning ether-drift experiments comes from the Ukrainian scientist Yuri Galaev. In his work, *Ethereal Wind in Experience of Millimetric Radiowave Propagation*, he writes in his abstract (translation corrected):

> The experimental hypothesis checks [for] the existence of such a material medium of a radiowave's propagation…as ether is propagated in [an] eight millimeter radiowave range. The ethereal wind speed and this speed's vertical gradient near the Earth's surface have been measured. The systematic measurement results do not contradict the initial hypothesis rules, and can be considered as experimental…confirmation about the ether's existence as a material medium in nature.[1046]

The body of the paper reports the following (translation corrected):

> The great work of collecting and analysis, dedicated to the ethereal wind problem, was performed by Atsukovsky. The ether model is offered and the ether dynamic picture of the world was designed in his works. The ether is represented as a material medium, which fills in the global space and has the properties of viscous and compressible gas; it is the building stuff of all material formations. The element of ether is an amer. The physical fields represent different forms of ether motion, *i.e.*, the ether is [the] material medium for electromagnetic wave

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[1045] *Einstein: The Life and Times*, p. 107.

[1046] "Ethereal Wind in Experience of Millimetric Radiowave Propagation," *Spacetime and Substance*, Vol. 2, No. 5 (10), 2001, p. 211.

> propagation. The gradient boundary layer is formed at [the] mutual motion of the solar system and ether near the Earth's surface, in which the ether running speed (ethereal wind) increases with the altitude. The ethereal wind apex is northern." To account for previous "null" results of modern experimentation he adds: "It is shown that metals have larger etheric dynamic resistance and interfere with the ether flows. Therefore, metering devices arranged in metal chambers are inadmissible. The work authors consider that the experiments are authentic"[1047]

In other words, those who found a "null" result mistakenly thought their experiments were accurate, but they never considered how the metal casing was shielding the ether. Galaev faults Miller's experiments for a different reason. He writes (translation corrected):

> …Miller's huge interferometer was disassembled [and] assembled again and adjusted while moving from Cleveland to Mt. Wilson observatory. Therefore, the technique, which Miller applied for speed-dependence measurement of the discovered motion from an altitude above the Earth's surface, was unacceptable to make a final conclusion for the benefit of ether's existence.[1048]

Galaev is probably right about the disassembling/assembling issue. Galaev's radiowave tests, which he outlines in excruciating mathematical and physical detail in his paper, were performed over five months, from September 1998 until January 1999. Measurements were taken round the clock, except on certain days, for a total of 1288 hours. In the final analysis, his findings confirm Miller's 1925 and Michelson's 1929 results. He writes:

> The obtained value…8,490 m/sec…is close to the result of 9,000 m/sec [of Miller]. A bit smaller value…in comparison [with Miller] can be explained due to the…slightly cross terrain. Miller built a light wooden house…with windows made of white canvas on all its sides. In 1929 Michelson, Pease, Pearson conducted a similar experiment in a fundamental building of an

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[1047] *Ibid.*, pp. 212-213.

[1048] *Ibid.*, p. 213.

> optical workshop…The ethereal wind measured speed was no more than 6,000 m/sec as a result.[1049]

He concludes (translation corrected):

> The executed analysis has shown that these results can be explained by radiowaves-propagation phenomenon in a space parentage-driving medium with a gradient layer speed in this medium flow near the Earth's surface. The gradient layer available testifies that this medium has the viscosity – the property of intrinsic material medium, *i.e.*, material consisting of separate particles. Thus the executed experimental results agree with the initial hypothesis positions about the ether material medium's existence in nature.[1050]

Galaev's remark that the ether has "viscosity" and "consists of separate particles" is precisely what we would expect for a medium to propagate waves. This is precisely what fellow Ukrainian, N. A. Zhuck found as well.[1051] Krasnoholovets agrees:

[1049] "Ethereal Wind in Experience of Millimetric Radiowave Propagation," *Spacetime and Substance*, Vol. 2, No. 5 (10), 2001, p. 224. Galaev's 6,000 m/sec for Michelson is due to his using 1/50th instead of 1/15th of the 300 km/sec for the anticipated solar system movement.

[1050] *Ibid.*, p. 213. See also Yuri M. Galaev, "Ether-drift. Experiment in the band of radio wave," Petit, Zhukovsky, 2000 (Russian); "Ether-drift effects in the experiments on radio wave propagation," (*Radiophysics and Electronics*, Institute for Radiophysics and Electronics of the National Academy of Sciences of Ukraine, Vol. 5, No. 1, pp. 119-132, 2000 (in Ukrainian). See also "The Measuring of Ether-Drift Velocity and Kinematic Ether Viscosity Within Optical Waves Band," (*Spacetime and Substance*, Vol. 3, No. 5 (15), 2002, pp. 207-224).

[1051] "The equation $d^2 X/dt^2 + H\, dx/dt = 0$ shows that the ether has viscosity. Also, it was shown that the bearer, [in] both gravitational and electromagnetic interactions, is the medium (ether) consisting of particles (amer) μ by a mass about 10^{-69} kg…taking into account the polarizability of an ether, *i.e.*, the presence in it of elastic properties (that has been confirmed by [the] spread of a wavelike process as electromagnetic waves) in the obtained equation it is necessary to add one more item $\mu\omega_o{}^2X$ named the recovery force (here w_o is the ether particles oscillations eigenfrequency). Zhuck, p. 208. See also N. A. Zhuck in "Cosmological Effects in Bulky Michelson-Morley Interferometers" (Ukrainian-Russian conference, Nov. 8-11, 2000, Abstracts, p. 73); and in *Spacetime and Substance* 1:5, 71-77 (2000), in Russian.

> A new optical method of the first order was proposed and implemented by Galaev (2002) for measurements of the aether-drift velocity and kinematic viscosity of aether. Galaev's results correlate well with the results of other researchers [Miller, 1933; Essen, 1955; Azjukowski, 1993]."[1052]

Another prominent experimenter and interpreter of these issues is Nobel laureate Maurice Allais. Allais wrote four papers on the results of Dayton Miller's work, and although he agreed with the results of the work, he added a different interpretation, namely, there is an optical anisotropy in space; and the cosmic velocity is towards Hercules, not Draco.[1053] All in all, Reginald Cahill sums up the findings rather well: "…these very different experiments show…absolute motion is one of the most startling but suppressed discoveries of the twentieth century."[1054]

[1052] Volodymyr Krasnoholovets, "The Tessellattice of Mother-Space," in *Einstein and Poincaré*, 2006, p. 144. He adds: "Overall, this research strongly supports the idea that the aether is a substrate responsible for propagation of electromagnetic waves….Other researchers demonstrated direct interaction of matter with a subquantum medium. In particular, the influence of a new 'strange' physical field on test subjects has been shown by Baurov (2002), Benford (2002) and Urutskoev *et al.* (2002). Similar effects are described by Shipov (1997)….One more incomprehensible phenomenon is the Kozyrev effect (Kozyrev and Nasonov, 1978) whereby a bolometer centrally located in the focal point of a telescope records a signal from a star much earlier than the light signal hits the focal point" (*ibid*).

[1053] "The Experiments of Dayton C. Miller (1925-1926) And the Theory of Relativity" in 21st Century, Science and Technology, Spring 1998, p. 31; Maurice Allais, "Des régularités très significatives dans les observations interférométriques de Dayton C. Miller (1925-1926) C. R. Academy of Science, Paris, t. 327, Sèrie II b, p. 1405-1410, 1999; "Nouvelles régularités très significatives dans les observations interférométriques de Dayton C. Miller (1925-1926)" C. R. Academy of Science, Paris, t. 327, Sèrie II b, p. 1411-1419, 1999); L'origine des régularités constatés dans les observations interférométriques de Dayton C. Miller (1925-1926): variations de temperature ou anisotropie de l'espace," C. R. Academy of Science, Paris, t. 1, Sèrie IV, p. 1205-1210, 2000). Allais was also noted for showing evidence of displacements in pendulums during solar eclipses (Chris Duif, "A Review of Conventional Explanations of Anomalous Observations during Solar Eclipses," in *Journal of Scientific Explanation* by Peter A Sturrock, 19:327, 2005).

[1054] Reginald Cahill, "The Einstein Postulates: 1905-2005: A Critical Review of the Evidence," in *Einstein and Poincaré: The Physical Vacuum*, 2006, p. 131. Cahill's caption under Dewitte's coaxial cable graph adds: "Dewitte 1991…coaxial cable, measured with atomic clocks, over three days and plotted against sidereal time….This remarkable agreement with the Miller interferometer

The Results of Sapphire Oscillators

Finally, many experiments occurring today to test the constancy of the speed of light make the same mistake that Michelson and Morley made over one hundred years ago. In regard to the 1887 experiment, Robert Kunzig of *Discover* magazine writes:

> Because Earth orbits the sun at 18 miles per second, Michelson and Morley reasoned that they should be able to detect an ether wind blowing through their Cleveland basement… Several groups are looking for such variations with modern versions of the Michelson-Morley experiment. Peter Wolf, Sebastien Bize, and their colleagues at the Paris Observatory measure *c* with microwaves oscillating at 12 gigahertz inside a small sapphire crystal…If *c* were to change because the orientation of the crystal had changed with respect to some "preferred" direction of space [the movement of the Earth around the sun], then the resonant frequency of the sapphire oscillator would change as well…Over a period of months, as Earth spins on its axis and revolves around the sun, the Paris researchers monitor their oscillator, comparing it with the microwaves from a hydrogen maser (microwave laser), which shouldn't be affected by Earth's motion. "What we measure is that small frequency difference," says Bize. "We look for modulations that correlate with the motion of Earth."[1055]

This description is rather interesting for several reasons. First, it is obvious that Kunzig, Wolf and Bize are basing their observations on the same unproven premise which plagued Michelson-Morley – they assume the Earth is moving. As it stands, they are going to find the same "null" result as Michelson-Morley and conclude that the speed of light is the same in all directions, and therefore constant. After a hundred years, no one seems to have caught on to the idea that the "null" result was a product of a motionless Earth. Second, in the control experiment Wolf and Bize used a hydrogen maser that they claim "shouldn't be affected by Earth's motion." This begs the question as to how a hydrogen maser will not be

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experiment shows that the detection of absolute motion is one of the great suppressed discoveries of physics. At least six other interferometer or coaxial cable experiments are consistent with these observations" (*ibid*).

[1055] Robert Kunzig, *Discover* cont. editor, "Testing the Limits of Einstein's Theories," September 2004, pp. 56-57.

affected by the "Earth's motion," while every other light source *is* affected by such motion? Moreover, if it is true that a hydrogen maser is not affected by the "Earth's motion," then the hydrogen maser should be used in all future interferometers to test whether the speed of light is truly constant. Of course, the problem would be to prove that a hydrogen maser is not affected by motion. But how can one do so if he already assumes the Earth is moving? Any test done on a hydrogen maser has Earth as its laboratory.

Kunzig proceeds in the article to give a description of a similar experiment being performed at Humboldt University in Berlin. The results are not surprising:

> Another group…uses a slightly different setup, comparing the outputs of a pair of sapphire oscillators. Over the past several years the two groups have achieved broadly comparable null results. "The speed of light in any two directions is the same to about one part in a quadrillion," says Holger Müller…That's equivalent to knowing the U. S. gross national product to within a penny.[1056]

Müller, of course, is basing his "null" result on the same unproven premise adopted by Michelson-Morley and Wolf-Bize. If they assume the Earth is moving at 30 km/sec, and if they happen to include the supposed speed of the solar system around the Milky Way at 300 km/sec, and the Milky Way is revolving around or moving toward another group of galaxy clusters at a speed of 600 km/sec, naturally, if they produce only a negligible km/sec result in their sapphire oscillators they will certainly conclude that the speed of light is unaffected, just as Michelson-Morley did. In effect, these kinds of experiments tell us nothing, except perhaps that science still uses the same prejudices and unproven assumptions to make their tallies come out as expected.

We can, however, see these same prejudices and assumptions in those who reject the results of sapphire oscillators. For example, **Reginald Cahill**, in his 2005 paper on the Michelson-Morley experiment, on the one hand, he recognizes that "only a Michelson interferometer in gas-mode can detect absolute motion, as we now see. So as better and better vacuum interferometers were developed over the last 70 years the rotation-induced fringe shift signature of absolute motion became smaller and smaller….and in recent years they had finally perfected a totally dud instrument," on the other hand, he believes that "absolute motion is not inconsistent with the various well-established relativistic effects; indeed, the evidence is that absolute motion is the cause of these relativistic effects, a proposal that goes back to Lorentz in the 19th century," which leads him to conclude that although the "Einstein-Minkowski spacetime ontology is invalidated, and in particular that Einstein's postulates regarding the invariant speed of light have always been in disagreement with experiment from the beginning….Then of course one must use a relativistic theory for the operation of the Michelson interferometer."[1057]

[1056] Robert Kunzig, *Discover* cont. editor, "Testing the Limits of Einstein's Theories," Sept. 2004, p. 57. Alan Kostelecký, "The Search for Relativity Violations," subtitle: "Ancient Light," *Scientific American*, Sept. 2004, p. 99.

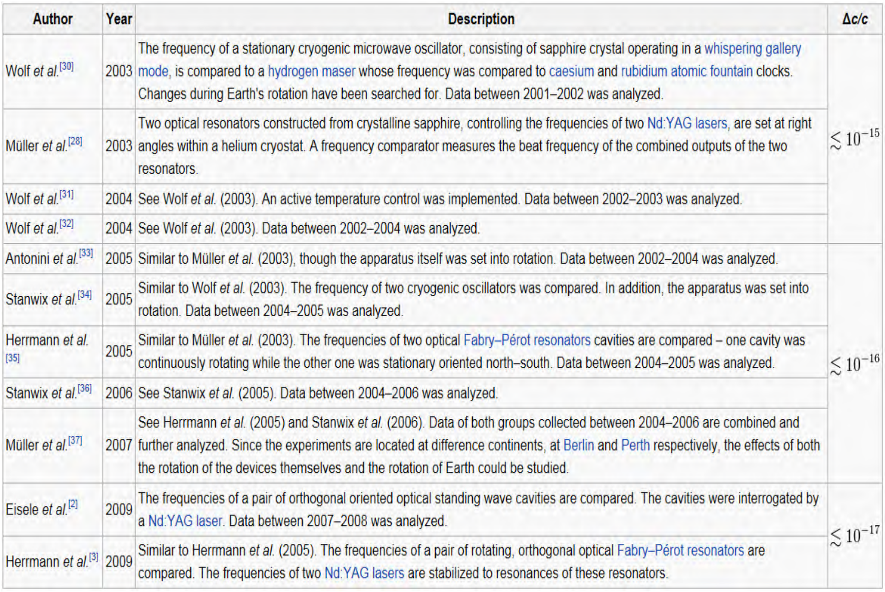
That Cahill doesn't see it as odd to invoke a relativistic framework to understand the Michelson-Morley experiment when, in fact, relativity came after and was purposely invented as an answer to the Michelson-Morley experiment, shows that anti-Einstein physicists can be just as presumptuous as Einstein's physicists. This is a classic case of trying to use as proof the very thing one is trying to prove. Cahill, as most scientists, cannot accept that the Earth is not revolving around the sun, which then forces him to use the Lorentzian answer to Michelson-Morley, that is, that the arm of the experimental apparatus shrunk during the experiment due to pressure from the ether caused by the Earth moving at 30km/sec. However, the perennial problem remains – all the Michelson-type interferometer experiments Cahill cites give, at their very highest, only one-third of the 30km/sec speed. So Cahill, even though he has handily proven the existence of ether and nullified Einstein, is straddled with an ether that is too small to prove his case. So he must seek another way to apply the Michelson results in order to arrive at 30km/sec or above. This will keep the Copernican theory intact and allow the Earth to revolve around the sun through the ether.

To arrive at this position, Cahill claims, since all previous analysis of Michelson-Morley (including Dayton Miller) used "Newtonian physics to calibrate the interferometer," this was a big mistake, for it only provided 8 to 10 km/sec, far below the needed 30km/sec. If they had used the "relativistic theory for the calibration of gas-mode interferometers" they would have found a result of 300km/sec, which is far above 30km/sec. Cahill claims that this application was "first used in 2002" by none other than Reginald Cahill.[1058] He arrives at the 300+ number by adjusting the refractive index, n, of the gas in the interferometer, where $n(n^2 - 1) = k$. He then states that "Michelson and Morley implicitly assumed the Newtonian value $k = 1$" and that "the Einstein postulates have that absolute motion has no meaning, and so effectively demands that $k = 0$. Using $k = 1$ gives only a nominal value for v_p, being some 8km/s for the Michelson and Morley experiment, and some 10km/s from Miller; the difference arising from the different latitude of Cleveland and Mt. Wilson," adding "that $n_{air} = 1.00029$ gives $k^2 = 0.00058$ for air, which explains why the observed fringe shifts were so small."[1059] Cahill claims that in order to calculate the speed correctly we need a higher k value, but he doesn't specify what that value is except to say "The remaning fits give a speed in excess of 300km/s" and "To get the Michelson-Morley Newtonian based value of some 8km/s we must multiply the above speeds by $k =$ ¾r ä r r r w=z 0.0241." Indeed, if we multiply 0.0241 by "$v_p = 351$ km/s" found in Cahill's Fig. 4, we get 8.45km/sec, close to Michelson's result.

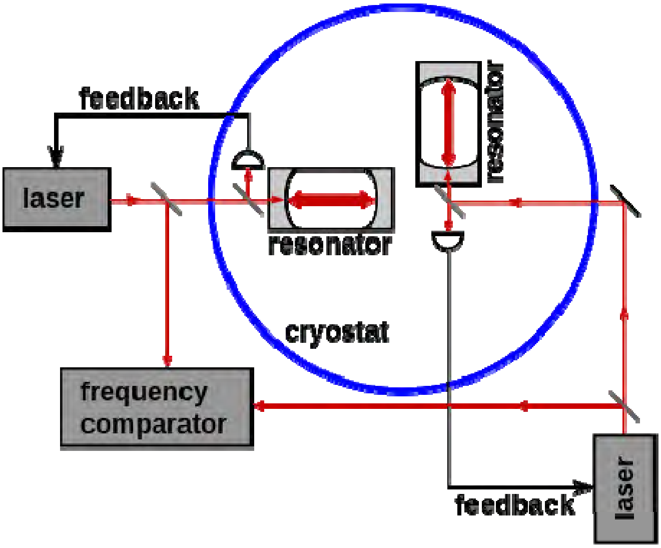
[1057] "The Michelson and Morley 1887 Experiment and the Discovery of Absolute Motion," Reginald T. Cahill, School of Chemistry, Physics and Earth Sciences, Flinders University, Adelaide, Australia, August 24, 2005, pp. 1-2, at arXiv:physics/0508174v1.

As to how Cahill justifies using a higher k value (other than his claim that "Newtonian physics had failed"), we don't receive much of an explanation, except that "the new theory of gravity required a re-analysis of the data," which includes Cahill's reference to his paper "Quantum Foam, Gravity and Gravitational Waves," in *Relativity, Gravitation, Cosmology* written the year prior, 2004, and his paper "Process Physics: From Information Theory to Quantum Space and Matter," in 2005. Apparently, this means that Cahill allows himself to bump up the k value due to his "new theory of gravity," and at the same time contrast his results against Miller's when he says "While the orbital motion of the earth about the sun slightly affects the RA [right ascension] in each month, and Miller used this effect to determine the value of k, the new theory of gravity required a re-analysis of the data, revealing that the solar system has a large observed galactic velocity of some 420+30km/s in the direction (RA = 5.2hr, Dec = –67deg)."[1060] In other words, Cahill's new theory of gravity allows him to use relativity and quantum mechanics to increase the k value, which in turn gives him a galactic ether drift of 420km/sec, and just for good measure he throws in "+30km/s" to account for the presumed revolution of the earth around the sun! Thus Cahill is guilty of the same mathematical fudging that he accuses the Einsteinian relativists. Both groups are desperate to avoid a motionless Earth to explain Michelson-Morely, and thus both groups distort the data to fit their theories.

[1058] *Ibid.*, p. 5.
[1059] *Ibid.*, pp. 5-6.
[1060] *Ibid.*, p. 7.



Author	Year	Description	Δc/c
Wolf *et al.*[30]	2003	The frequency of a stationary cryogenic microwave oscillator, consisting of sapphire crystal operating in a whispering gallery mode, is compared to a hydrogen maser whose frequency was compared to caesium and rubidium atomic fountain clocks. Changes during Earth's rotation have been searched for. Data between 2001–2002 was analyzed.	$\lesssim 10^{-15}$
Müller *et al.*[28]	2003	Two optical resonators constructed from crystalline sapphire, controlling the frequencies of two Nd:YAG lasers, are set at right angles within a helium cryostat. A frequency comparator measures the beat frequency of the combined outputs of the two resonators.	
Wolf *et al.*[31]	2004	See Wolf *et al.* (2003). An active temperature control was implemented. Data between 2002–2003 was analyzed.	
Wolf *et al.*[32]	2004	See Wolf *et al.* (2003). Data between 2002–2004 was analyzed.	
Antonini *et al.*[33]	2005	Similar to Müller *et al.* (2003), though the apparatus itself was set into rotation. Data between 2002–2004 was analyzed.	$\lesssim 10^{-16}$
Stanwix *et al.*[34]	2005	Similar to Wolf *et al.* (2003). The frequency of two cryogenic oscillators was compared. In addition, the apparatus was set into rotation. Data between 2004–2005 was analyzed.	
Herrmann *et al.*[35]	2005	Similar to Müller *et al.* (2003). The frequencies of two optical Fabry–Pérot resonators cavities are compared – one cavity was continuously rotating while the other one was stationary oriented north–south. Data between 2004–2005 was analyzed.	
Stanwix *et al.*[36]	2006	See Stanwix *et al.* (2005). Data between 2004–2006 was analyzed.	
Müller *et al.*[37]	2007	See Herrmann *et al.* (2005) and Stanwix *et al.* (2006). Data of both groups collected between 2004–2006 are combined and further analyzed. Since the experiments are located at difference continents, at Berlin and Perth respectively, the effects of both the rotation of the devices themselves and the rotation of Earth could be studied.	
Eisele *et al.*[2]	2009	The frequencies of a pair of orthogonal oriented optical standing wave cavities are compared. The cavities were interrogated by a Nd:YAG laser. Data between 2007–2008 was analyzed.	$\lesssim 10^{-17}$
Herrmann *et al.*[3]	2009	Similar to Herrmann *et al.* (2005). The frequencies of a pair of rotating, orthogonal optical Fabry–Pérot resonators are compared. The frequencies of two Nd:YAG lasers are stabilized to resonances of these resonators.	



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[1061] http://en.wikipedia.org/wiki/Michelson%E2%80%93Morley_experiment. See also "Laboratory Test of the Isotropy of Light Propagation at the 10^{-17} Level" by Ch. Eisele, A. Yu. Nevsky and S. Schiller, *Physical Review Letters* 103, 090401 (2009).

The real problem with oscillators or resonators is precisely the very attempt they make to help the Michelson-Morley type apparatus do their job of determining the anisotropy of space. That is, a vacuum removes all of the traceable ether in the atomic scale (*e.g.*, electron-positron pairings) and leaves only the untraceable ether in the Planck scale (*e.g.*, quantum foam). Removing all the traceable ether means that a resonator would need to reach a $\Delta c/c$ level of 10^{-33} to detect the Planck ether – a virtual impossibility.

Chapter 6

What is Space in the Geocentric Universe?

Perhaps the main question that has occupied science since the time of Descartes (who understood space as filled with whirlpools of force he called "vortices") is whether space is composed of a substance, and, if so, what is it? One of the reasons the question of ether keeps coming to the forefront stems from our basic knowledge that, in order for something to be transferred from one place to another, it must travel through the space between the two places. Whether it is light, electricity, magnetism, gravity, sound, or material objects, it seems that all physical things must travel through a medium. At least everyone thought so up until the time of Einstein's Special Relativity theory. Logically, if there is nothing between points separated by a distance, what difference should the distance make? More of nothing is still nothing. Einstein said light always traveled at a constant speed in a vacuum, but if light travels a certain distance of "nothing" between source and receiver, where was the light before it reached the receiver? Does space know place?

The issue of what constitutes space is not only a science question but also a philosophical question. If, for example, we employ the services of a strong vacuum pump and eliminate all the air out of a container, do we now conclude there is "nothing" in the container? Philosophically speaking, how can "nothing" exist? Since the container hasn't collapsed, our intuition tells us that the container is still taking up space, even though there is, presumably, "nothing" inside of it. Incidentally, one cannot argue that, due to the inefficiency of vacuum pumps, there may be at least some molecules of air left in the container. Even if that were the case, the molecules, sparse as they would be, would be separated by vast spaces between them, so the question remains: what constitutes the space between the few remaining molecules in the container? As one modern physicist answered the question: "But what we've learned is…if you take everything away, there's still something there."[1062] Or as another physicist put it:

[1062] Lawrence M. Krauss, "Questions That Plague Physics," *Scientific American*, Sept. 2004, p. 83. Krauss, formerly chairmen of the physics department at Case Western Reserve University and now professor at Arizona State University, is, however, an outspoken critic of String Theory and Quantum Loop Gravity, as outlined in his books: *Hiding in the Mirror: The Mysterious Allure of Extra Dimensions*. He is also an advocate of keeping Creation science out of the public

> We can no longer sustain the simple idea that a vacuum is just an empty box. If we could say that there were no particles in a box, that it was completely empty of all mass and energy, then we would have to violate the Uncertainty Principle because we would require perfect information about motion at every point and about the energy of the system at a given instant of time…[1063]

True enough. Science is at a loss to tell us what a vacuum really is. We see this in other phenomena as well. Ever since the time of Ernest Rutherford (1871-1937), science has settled upon the idea that the atom itself is composed of mostly empty space between the electrons whizzing around the protons and neutrons. Under current theory, only a quadrillionth of the atom is occupied by the atom's particles. But isn't the "empty space" of the atom the same as the "nothing" left in the container by the vacuum pump?

For the sake of argument, let's posit that there is a substance much smaller than the electrons and protons that fits compactly between them. The grains of this substance must then be smaller than any of the numerous subatomic particles man has discovered, including neutrinos, muons, gluons, mesons, kaons, *etc*. Let's say that this infinitesimally small substance also fills the space of the "nothing" left in our vacuum container, so that we can now say that there is "something" still in the container, although we can neither see it nor possess instruments capable of detecting it. This was precisely the thinking of scientists from Descartes to Lorentz. They knew instinctively that some kind of medium had to exist, at least on a theoretical basis, even if they couldn't detect it. While Newton resolved in his 1687 book *Principia Mathematica* that "I design only to give mathematical notions of these forces, without consideration of their physical causes and seats," which led to his concept of "action-at-a-distance" whereby gravity was mysteriously transported over vast distances by some mysterious yet unexplained means, nevertheless, he believed that space was filled with something. He writes:

> May not planets and comets, and all gross bodies, perform their motions more freely, and with less resistance in this aethereal medium than in any fluid, which fills all space adequately without leaving any pores, and by consequence is much denser

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schools. See video at *New Scientist* that gives a popular view of the issue: http://bcove.me/d3c6fmrh

[1063] John D. Barrow, *The Book of Nothing: Vacuums, Voids, and the Latest Ideas about the Origins of the Universe*, 2000; Vintage Press, 2002, pp. 204-205.

> than quick-silver and gold? And may not its resistance be so small, as to be inconsiderable? For instance; if this aether (for so I will call it) should be supposed 700,000 times more elastick than our air, and above 700,000 times more rare; its resistance would be above 600,000,000 times less than that of water. And so small a resistance would scarce make any sensible alteration in the motions of the planets in ten thousand years.[1064]

Others after him held closely to this conviction, since it explained so many other phenomena in nature. As Robert Hooke understood it:

> The mass of æther is all æther, but the mass of gold, which we conceive, is not all gold; but there is an intermixture, and that vastly more than is commonly supposed, of æther with it; so that vacuity, as it is commonly thought, or erroneously supposed, is a more dense body than the gold as gold. But if we consider the whole content of the one with that of the other, within the same or equal quantity of expatiation, then they are both equally containing the material or body.[1065]

James Clerk Maxwell (1831 – 1879)

James Clerk Maxwell's entire electromagnetic theory was built on the foundation of ether, and he held the same idea as Newton regarding the constitution of interplanetary space. He writes:

> Ether or Æther (αἰθήρ probably from αἴθω, I burn) a material substance of a more subtle kind than visible bodies, supposed to exist in those parts of space which are apparently empty…. Whatever difficulties we may have in forming a consistent idea of the constitution of the aether, there can be no doubt that the interplanetary and interstellar spaces are not empty, but are occupied by a material substance or body, which is certainly the largest, and probably the most uniform body of

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[1064] Isaac Newton, *Opticks*, Fourth edition, 1730, Question 22. Newton addresses the issue of ether from Questions 18-31, mostly in reference to the travel of light through ether.

[1065] *From the Posthumous Works of Robert Hooke*, 1705, pp. 171-172, cited in O. Lodge, *The Ether of Space*, p. 98.

> which we have any knowledge. Whether this vast homogeneous expanse of isotropic matter is fitted not only to be a medium of physical interaction between distant bodies, and to fulfill other physical functions of which, perhaps, we have as yet no conception, but also...to constitute the material organism of beings exercising functions of life and mind as high or higher than ours are at present - is a question far transcending the limits of physical speculation.[1066]

> The vast interplanetary and interstellar regions will no longer be regarded as waste places in the universe, which the Creator has not seen fit to fill with the symbols of the manifold order of His kingdom. We shall find them to be already full of this wonderful medium; so full, that no human power can remove it from the smallest portion of space, or produce the slightest flaw in its infinite continuity. It extends unbroken from star to star; and when a molecule of hydrogen vibrates in the dog-star, the medium receives the impulses of these vibrations, and after carrying them in its immense bosom for several years, delivers them, in due course, regular order, and full tale, into the spectroscope of Mr. Huggins, at Tulse Hill.[1067]

As we have noted in previous chapters, the scientists of this day found at least something resembling a medium in space in all their interferometer experiments of the late 1800s and into the 1900s. Regardless of how small, they measured some resistance to light traveling in a specific direction on the surface of the Earth. As we also noted, since that resistance was smaller than what they expected for an Earth supposedly revolving around the sun at 30 km/sec, the experimenters invariably produced erroneous interpretations, which resulted in Einstein's hasty rejection of ether, and with that, the missed opportunity of finding a proper explanation for the small positive results afforded by actual experimental evidence.

[1066] *Encyclopedia Britannica*, 9th edition, Edinburgh: Adam and Charles Black, 1875, under the title “Ether,” republished by Cambridge University Press, 1890. Expanding on Maxwell’s Greek, the word αἰθήρ commonly referred to the upper, purer air, as opposed to ἀήρ, the lower air or atmosphere. This distinction would make the ether the rarified interplanetary medium in distinction to the air near the Earth. Although αἴθω may be the closest derivative, it was a separate word found only in the present and imperfect tense, ἦθον, meaning “to light or kindle,” and rarely “to burn or blaze.” Another significant derivative is αἴθων, the participle of αἴθω, which either means “fiery burning” or “flashing or glittering metal” (Liddell and Scott, *Greek-English Lexicon*, Oxford University Press, 1871, 1977, pp. 18-19). The “metal” aspect of ether has some representation in the Hebrew word eyqr translated as “firmament” in Genesis 1:6-9, since the Hebrew refers, among other meanings, to a beaten down metal, denoting the firmness of its constitution.

[1067] *Encyclopedia Britannica*, 9th edition, Edinburgh: Adam and Charles Black, 1875, under the title “Ether,” republished by Cambridge University Press, 1890, as cited in Sir Oliver Lodge, *The Ether of Space*, 1909, p. 114.

But if space has substance, what is it? We know that even though it is not seen, nevertheless, it impedes the light circling an interferometer. If it is smaller than an atom's components, how small can it be? Will it ever reach a point of being "indivisible"? This question introduces us to another philosophical problem – the problem of extension and divisibility. The fact that matter exists means that it extends into space. Descartes developed the Cartesian coordinates to help determine the exact "point" in space an object occupies.[1068] Although, on the one hand, the concept of occupying space is very simple, on the other hand, the fact that something is extended means that it is divisible. A twelve-inch rod can be cut into two pieces of six inches, and a six-inch rod is divisible into two three-inch pieces, and so on and so on. Theoretically, we could divide the rod in half for an infinite number of times. We can divide the rod manually as well, but we may reach a point where, at least on a physical basis (not theoretical), we cannot divide the rod any longer.[1069] In other words, matter might reach a point where it is physically indivisible. The Greeks called this stage of indivisibility the "atom." But just how small can nature be before it reaches its limit of physical divisibility? We may never know for certain, but we do have some parameters with which to work, which we will investigate momentarily.

[1068] Descartes formulated the Cartesian coordinates by observing a fly flying in his room. He reasoned that the exact location of the fly in flight could be calculated at any one instant by measuring the distance the fly was from the floor and two adjacent sides of the room.

[1069] This brings up the thorny issue concerning theoretical postulates formed from "thought experiments" as opposed to those formed from physical evidence found by experiment. Theoretical thought experiments may require causes and effects that are physically impossible to attain, and thus leave the hypotheses issuing from them as either false or unprovable. Conversely, although experimental evidence is the best means of physically verifying the truth, we may not possess the mechanical apparatus to determine whether a theoretical concept is true or false, as is demonstrated by the Heisenberg Uncertainty Principle. A variation of this is Zeno's Paradox, which says that if the distance to an end point is halved successively, one will never reach the end point since there will always be a space to halve.

Einstein Goes Back to Ether

Perhaps the best place to begin in discovering what constitutes space is to investigate the turn of events that took place in Albert Einstein's theorizing on the subject. This is an important starting point for the simple reason that, whereas from the years 1905-1915 Einstein had rejected the notion of ether filling the constitution of space, it was in the year 1916 that he re-adopted ether as a constituent part of his theory of General Relativity, although with extensive modifications to Lorentzian ether. As his biographer Abraham Pais put it: "The aether of the general theory of relativity is a medium without mechanical and kinematic properties, but which codetermines mechanical and electromagnetic events."[1070] In 1916 Einstein wrote:

> …in 1905 I was of the opinion that it was no longer allowed to speak about the ether in physics. This opinion, however, was too radical, as we will see later when we discuss the general theory of relativity. It does remain allowed, as always, to introduce a medium filling all space and to assume that the electromagnetic fields (and matter as well) are its states…once again "empty" space appears as endowed with physical properties, *i.e.*, no longer as physically empty, as seemed to be the case according to special relativity. One can thus say that the ether is resurrected in the general theory of relativity….Since in the new theory, metric facts can no longer be separated from "true" physical facts, the concepts of "space" and "ether" merge together.[1071]
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> It would have been more correct if I had limited myself, in my earlier publications, to emphasizing only the non-existence of an ether velocity, instead of arguing the total non-existence of the

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[1070] *Subtle is the Lord*, Oxford, 1982, 2005, p. 313.

[1071] Albert Einstein, "Grundgedanken und Methoden der Relativitätstheorie in ihrer Entwicklung dargestellt," *Morgan Manuscript*, EA 2070, as cited in Ludwik Kostro, *Einstein and the Ether*, Aperion, 2000, p. 2. For a good summation of Einstein's reasoning in regard to reviving the ether concept, see Galina Granek's "Einstein's Ether: Why Did Einstein Come Back to the Ether?" *Apeiron*, vol. 8, no. 3, July 2001; "Einstein's Ether: Rotational Motion of the Earth," *Apeiron*, vol. 8, no. 2, April 2001; Ludwik Kostro, "Einstein and the Ether," *Electronics and Wireless World*, 94:238-239 (1988). Kostro writes: "the notion of ether was not destroyed by Einstein, as the general public believes" (*ibid*., p. 239); "Lorentz wrote a letter to Einstein in which he maintained that the general theory of relativity admits of a stationary ether hypothesis. In reply, Einstein introduced his new non-stationary ether hypothesis" (*ibid*., p. 238).

> ether, for I can see that with the word *ether* we say nothing else than that space has to be viewed as a carrier of physical qualities.[1072]

Prior to this shift, Einstein had made the following statements, five years apart, the first from his famous 1905 paper:

> The introduction of a 'light ether' will prove to be superfluous, because the view here to be developed will introduce neither a 'space at absolute rest' provided with special properties, nor assign a velocity vector to a point of empty space in which electro-magnetic processes take place.[1073]

The second, in 1910, stated: "The first step to be made…is to renounce the ether."[1074] So there we have it. What Special Relativity taketh away with the left hand, General Relativity giveth back with the right hand. Few are aware of this dramatic shift in Einstein's thinking, and of those, many are embarrassed to admit that the ether concept had to be reintroduced and coincided with the very leg of the Relativity theory that had vociferously denied it. The reason? Prior to 1916, Einstein wanted to divest physics entirely of the notion of absolute rest. The concept of an immobile Earth or immobile ether was, for some odd reason, repugnant to him. Having already accepted Copernican cosmology,[1075] the ether was the last thing standing in his way. As he understood it, if ether existed, it necessitated that there be absolute space. If there is absolute space, then there is absolute rest. Obviously, Relativity cannot exist with anything being at absolute rest, for, by definition, the theory would be nullified.

The task of putting the nails into ether's coffin was not so easy, however. Henri Poincaré left some unfinished business that Einstein still had to address. Poincaré continued to insist upon the existence of ether for three main reasons: (1) stellar aberration (which we covered previously in the study of the Arago and Airy experiments); (2) "action-at-a-distance" whereby gravity and electromagnetism could be transmitted over vast distances; (3) rotational motions (of which we saw an example in Sagnac's 1913 experiment). Although Einstein felt that he had answered the phenomenon of stellar aberration (but, as we noted earlier, in reality he had not), he did not have a quick answer for rotation and action-at-a-distance.

[1072] Albert Einstein, "Letter to H. A. Lorentz, November 15, 1919," EA 16, 494, as cited in Ludwik Kostro, *Einstein and the Ether*, *Aperion*, 2000, p. 2.

[1073] "Zur Elektrodynamik bewegter Körper," *Annalen der Physik*, 4th series, 17, Sept. 26, 1905.

[1074] "Le Principe de relativité et ses consequences dans la physique moderne," *Archives de sciences physiques et naturalles*, 29, pp. 18-19.

[1075] In 1938 Einstein wrote: "Since the time of Copernicus we have known that the Earth rotates on its axis and moves around the sun. Even this simple idea, so clear to everyone, was not left untouched by the advance of science. But let us leave this question for the time being and accept Copernicus' point of view" (Albert Einstein and Leopold Infeld, *The Evolution of Physics*, 1938, 1966, pp. 154-155).

In addition, Dayton Miller, as we have detailed earlier, was hot on Einstein's trail between 1921 and 1933. With Miller's new and improved interferometer experiments, Einstein could run but not hide from the mounting evidence for the existence of ether. Along these same lines, in 1923 Ernst Gehrcke published the article "The Contradictions between the Ether Theory and Relativity Theory and Experimental Tests"[1076] in which he reexamined the Michelson-Morley, Michelson-Miller, and Georges Sagnac experiments, concluding that Relativity theory simply did not have a good explanation for the results.

In the late 1920s, Paul R. Heyl posed a different yet related question to Einstein:

> …Einstein pointed out that there might be no such thing as gravitational force any more than there is a centrifugal force; that both may be considered as manifestations of inertia aided in the case of gravitation by curved space acting much like a mechanical surface of constraint. For this reason it is sometimes said that the theory of relativity has done away with the ether. I hardly think that is a fair statement…[I]f relativity ignores the ether, does it not introduce what is to all intents and purposes its equivalent? The ether was supposed to be a medium filling all space that otherwise would be empty. Einstein supposes space itself to be enough of an entity to have a curvature, and to be "empty" only where and when it is flat. But if space can be bent and can straighten out again, why can it not repeat this process with sufficient rapidity to be called a vibration? And what difference does it make whether it is space itself that vibrates, or something that fills space? Back in every one of our heads is the idea that there is something which philosophers call a "thing-in-itself" which is responsible for our sensations of light and

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[1076] German title: "Die Gegensätze zwischen der Äthertheorie und Relativitätstheorie und ihre experimentale Prüfung," *ZftP*, 4, 1923, Nr. 9, pp. 292-299, Kostro, p. 135.

> electricity; and whether we spell it ETHER or SPACE, what does it matter?[1077]

As 1993 Nobel Prize winner, **Robert Laughlin,** puts it:

> It is ironic that Einstein's most creative work, the general theory of relativity, should boil down to conceptualizing space as a medium when his original premise was that no such medium existed…. Einstein… utterly rejected the idea of ether and inferred from its nonexistence that the equations of electromagnetism had to be relative. But this same thought process led in the end to the very ether he had first rejected, albeit one with some special properties that ordinary elastic matter does not have. The word "ether" has extremely negative connotations in theoretical physics because of its past association with opposition to relativity. This is unfortunate because, stripped of these connotations, it rather nicely captures the way most physicists actually think about the vacuum.
>
> In the early days of relativity the conviction that light must be waves of something ran so strong that Einstein was widely dismissed. Even when Michelson and Morley demonstrated that the earth's orbital motion through the ether could not be detected, opponents argued that the earth must be dragging an envelope of ether along with it because relativity was lunacy and could not possibly be right…. Relativity actually says nothing about the existence or nonexistence of matter pervading the universe, only that such matter must have relativistic symmetry.

And he concludes with this important paragraph:

[1077] Paul R. Heyl, "The History and Present Status of the Physicist's Concept of Light," in "Proceedings of the Michelson Meeting of the Optical Society of America," *Journal of the Optical Society of America*, vol. XVIII, March 1929, p. 191.

> It turns out that such matter exists. About the time relativity was becoming accepted, studies of radioactivity began showing that the empty vacuum of space had spectroscopic structure similar to that of ordinary quantum solids and fluids. Subsequent studies with large particle accelerators have now led us to understand that space is more like a piece of window glass than ideal Newtonian emptiness. It is filled with "stuff" that is normally transparent but can be made visible by hitting it sufficiently hard to knock out a part. The modern concept of the vacuum of space, confirmed every day by experiment, is a relativistic ether. But we do not call it this because it is taboo.[1078]

Einstein was thus forced back to at least some concept of ether, but here is where he wanted it both ways. He needed ether to account for the physical effects of action-at-a-distance and rotational motion, but he did not want to give ether any physical attributes, for if he did, that would nullify Relativity theory. As he puts it:

> The special theory of relativity forbids us to assume the ether to consist of particles observable through time, but the hypothesis of ether is itself not in conflict with the special theory of relativity. Only we must be on our guard against ascribing a state of motion to the ether.[1079]

So, according to Einstein's wishes, we can have the "concept" of ether but we cannot have "particles" or "motion" of ether. His followers were parroting the same reasoning. In 1923, Arthur Eddington had caught on to Einstein's rationale, stating:

[1078] Robert B. Laughlin, *A Different Universe: Reinventing Physics from the Bottom Down*, 2005, pp. 120-121. The two chapters of Laughlin's book that deal with these issues are: "The Nuclear Family," (pp. 99-116 and "The Fabric of Space-Time" (pp. 117-126). Laughlin can speak so boldly about ether and not be afraid of suffering chastisement because, as one author notes: "…the impression of suggesting an ether theory is carefully avoided, because such can still be career suicide. Only physicists who were established beyond reproach could discuss ether-like aspects openly, like George Chapline, Gerd 't Hooft, Robert Laughlin, or Frank Wilczek, just to alphabetically list a few who did. Today, we finally witness the dams breaking and ever more people dare to 'come out.'" Sascha Vongehr, "Supporting Abstract Relational Space-Time as Fundamental without Doctrinism Against Emergence," Nanjing University, China, Dec. 2009, p. 2.

[1079] May, 1920 Leyden address, para. 16.

> If a substantial aether analogous to a material ocean exists, it must rigidify, as it were, a definite space; and whether the observer or whether nature pays any attention to that space or not, a fundamental separation of space and time must be there. Some would cut the knot by denying the aether altogether. We do not consider that desirable, or, so far as we can see, possible; but we do deny that the aether need have such properties as to separate space and time in the way supposed.[1080]

In this way, Einstein allows himself to maintain the key to his Relativity theory (the denial of absolute space and rest), yet have at least a conceptual basis for understanding action-at-a-distance and rotational motion. Although he says this "conceptual" ether has no "particles" or "motion," we are then told in the next paragraph that it, nevertheless, has at least some physical qualities. He writes:

> But on the other hand there is a weighty argument to be adduced in favor of the ether hypothesis. To deny the ether is ultimately to assume that empty space has no physical qualities whatsoever. The fundamental facts of mechanics do not harmonize with this view. For the mechanical behavior of a corporeal system hovering freely in empty space depends not only on relative position (distances) and relative velocities, but also on its state of rotation, which physically may be taken as a characteristic not appertaining to the system in itself. In order to be able to look upon the rotation of the system, at least formally, as something real, Newton objectivizes space. Since he classes his absolute space together with real things, for him rotation relative to an absolute space is also something real. Newton might no less well have called his absolute space "ether"; what is essential is merely that besides observable objects, another thing, which is not perceptible, must be looked upon as real, to enable acceleration or rotation to be looked upon as something real.[1081]

Here Einstein is preparing us for his concept of ether by citing Newton's notion of space. Since Newton made no absolute claims to knowing the constitution of space or the cause of gravity, Einstein feels safe in appealing to Newton. Einstein needs to "objectivize" space in order to explain movement within it (*e.g.*, rotation and action-at-a-distance), but other than his metrical tensor fields developed from the geometry of Minkowski and Riemann, he does not reveal what "physical qualities" he will eventually attribute to space.

[1080] Arthur Eddinton, *Space, Time and Gravitation*, p. 39.
[1081] *Ibid.*, para. 18.

Ludwik Kostro has done the most work in retracing Einstein's steps toward reviving the ether. In fact, Kostro reveals that up to our day no one had made a thorough report of Einstein's concept of the ether, stating that his is "the first comprehensive history of Einstein's concept of the ether."[1082] Kostro points out, however, like many other innovations of science attributed to Einstein, this, too, was the product of someone prior to Einstein that he had read but to whom he had not given any credit. The German physicist Paul Drude had written about the concept in 1900 in his work *Handbook of Optics*. Drude allows ether "…if one understands by ether not a substance, but only space endowed with certain physical characteristics."[1083] Kostro comments:

> We know for sure…that Einstein read the…*Handbook of Optics*, because upon reading it he wrote a letter to the author in which he offered his comments on the book….Einstein must also have read Drude's *Physics of the Ether Based on Electro-magnetism*, which appeared in 1894…. Similarities between expressions, and even identical ways they were used, offer proof that Einstein studied these works thoroughly. In his subsequent works Einstein would define the ether as "physical space endowed with physical attributes."[1084]

All in all, Einstein envisioned three different kinds of ether: one for the Special theory; one for the General theory; and one for his hoped-for Unified theory. The ether for the Special theory originated from Lorentz, but Einstein rejected it because Lorentz understood it as an immobile ether, identical to the concept held by the 1905 Nobel Prize winner Philipp

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[1082] Ludwik Kostro, *Einstein and the Ether*, 2000, p. 7. Kostro adds: "There do exist a number of articles outlining the history of this subject by the author of the present work [Kostro]. In works by other historians of physics which the author had been able to obtain, Einstein's ether and its features are given a mere mention. Many documents presented or quoted in this work have never been published. The documentation I have drawn upon here has been collected by the library of the Museum of Science and Technology in Munich (Deutsches Museum) and in the Bayerische Staatsbibliothek in Munich" (*ibid*).

[1083] Kostro, *Einstein and the Ether*, p. 18.

[1084] *Ibid.*, pp. 19-20.

Lenard,[1085] and reminiscent of the "absolute space" of Isaac Newton. The ether of General Relativity only had to incorporate gravity, thus Einstein had to develop another type of ether in order to unify gravity with electromagnetism, which led to embellishing Riemann's geometry with what was known as "tele-parallelism" and six more tensor fields in addition to the ten already being used by General Relativity. Of course, this attempt brought Einstein to the end of his rope, and he began to see that the whole endeavor might be seriously flawed, as we noted previously in his private letters to Maurice Solovine and others. Despite his valiant attempts, Einstein simply could not find singularity-free equations to his General or Unified Field theory.[1086]

The details of Einstein's thought process are of interest here. In 1916, Einstein was distancing himself from Ernst Mach's philosophy, although he would keep Mach's concept of the "distant masses" (stars) as providing the inertial frame of the universe and the inertial force of local phenomena. (Mach maintained his belief in ether in order to have a medium to transport the force from the stars). By the time Einstein gave his University of Leyden address on May 5, 1920, he had been sufficiently influenced by Henrick Lorentz's ether-based electromagnetic and cosmological views, and thus he admitted publically for the first time that the concept of ether was vital to physics, and, in fact, physics could not exist without it. First, Einstein reviews the various ether theories of the past. In the first half of the nineteenth century, Einstein understands that in the era of Fizeau and Fresnel:

> …It appeared beyond question that light must be interpreted as a vibratory process in an elastic medium filling up universal space. It also seemed to be a necessary consequence of the fact that light is capable of polarization, that this medium, the ether, must be of the nature of a solid body, because transverse waves are not possible in a fluid, but only in a solid. Thus the physicists were bound to arrive at the theory of the "quasi-rigid"

[1085] Philipp Lenard, *Über Äther und Materie, Zweite, ausführlichere und mit Zusätzen versehene Auflage*, Heidelberg, C. Winters Universitätsbuchhandlung, 1911, cited in Kostro, p. 42.

[1086] Kostro says that at one time Einstein arrived at a singularity-free theory by "removing the denominator from the equations." Quoting Einstein: "If one modifies the equations in an unessential manner so as to make them free from denominators, regular solutions can be obtained, provided one treats the physical space as consisting of two congruent sheets." Kostro also reveals that Einstein would eventually abandon this solution, however (*Einstein and the Ether*, pp. 138-140).

> luminiferous ether, the parts of which can carry out no movements relative to one another except the small movements of deformation which correspond to light-waves.[1087]

As for Maxwell and Hertz, Einstein said:

> …the ether indeed still had properties which were purely mechanical, although of a much more complicated kind than the mechanical properties of tangible solid bodies. But neither Maxwell nor his followers succeeded in elaborating a mechanical model for the ether which might furnish a satisfactory mechanical interpretation of Maxwell's laws of the electro-magnetic field….Thus the purely mechanical view of nature was gradually abandoned. But this change led to a fundamental dualism which in the long-run was insupportable…. This dualism still confronts us in unextenuated form in the theory of Hertz, where matter appears not only as the bearer of velocities, kinetic energy and mechanical pressures, but also as the bearer of electromagnetic fields…. The ether appears indistinguishable in its functions from ordinary matter. Within matter it takes part in the motion of matter and in empty space it has everywhere a velocity…[1088]

This then leads to the theory of Lorentz. Einstein describes it as follows:

> Such was the state of things when H. A. Lorentz entered upon the scene….He [took] from ether its mechanical, and from matter its electromagnetic, qualities. As in empty space, so too in the interior of material dies, the ether, and not matter viewed atomistically, was exclusively the seat of electro-magnetic field. According to Lorentz the elementary particles of matter alone are capable of carrying out movements; their electromagnetic activity is entirely confined to the carrying of electrical charges. Thus Lorentz succeeded in reducing all electromagnetic happenings to Maxwell's equations for free space. As to the mechanical nature of the Lorentzian ether, it may be said of it, in a somewhat playful spirit, that immobility is the only mechanical

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[1087] Einstein's Lecture at the University of Leyden, Germany, May 5, 1920.

[1088] *Ibid*. See also Arthur Miller's *Albert Einstein's Special Theory of Relativity* for an in-depth explanation of Hertz's contribution to the electromagnetic/ether issue, pp. 11-14.

> property of which it has not been deprived by H. A. Lorentz. It may be added that the whole change in the conception of the ether which the special theory of relativity brought about, consisted in taking away from the ether its last mechanical quality, namely, its immobility.

Next Einstein explains by means of his famous K and K' models what led him, initially, to dispense with ether.

> The space-time and the kinematics of the special theory of relativity were modelled on the Maxwell-Lorentz theory of the electromagnetic field. This theory therefore satisfies the conditions of the special theory of relativity, but when viewed from the latter it acquires a novel aspect. For if K be a system of coordinates relative to which the Lorentzian ether is at rest, the Maxwell-Lorentz equations are valid primarily with reference to K. But by the special theory of relativity the same equations without any change of meaning also hold in relation to any new system of coordinates K' which is moving in uniform translation relative to K. Now comes the anxious question: Why must I in the theory distinguish the K system above all K' systems, which are physically equivalent to it in all respects, by assuming that the ether is at rest relative to the K system? For the theoretician such an asymmetry in the theoretical structure, with no corresponding asymmetry in the system of experience, is intolerable. If we assume the ether to be at rest relative to K, but in motion relative to K', the physical equivalence of K and K' seems to me from the logical standpoint, not indeed downright incorrect, but nevertheless unacceptable.

What Einstein is trying to say is that, by accepting Special Relativity as a fact (which he believes has been proven by the Michelson-Morley experiment), then it must also be accepted that the "space-time and the kinematics of the Special Theory of Relativity" must hold for all objects and locations, whether at rest or in motion. Hence, it would be incorrect to make a distinction between one object and another by saying that one object is *at rest in ether* and the other is *moving in ether*, since, if both objects experience the same "space-time" effects regardless of their relationship to the ether, then the ether had nothing to do with what they experienced. For Einstein, ether not only becomes superfluous, it actually gets in the way of logic. Logic requires that if a substance such as ether exists, then it must produce different effects on an object at rest as opposed to an object in motion. Since there is no difference, in Einstein's logic one can then dispense with ether. Thus Einstein concludes:

> The next position which it was possible to take up in face of this state of things appeared to be the following. The ether does not exist at all. The electromagnetic fields are not states of a medium, and are not bound down to any bearer, but they are independent realities which are not reducible to anything else, exactly like the atoms of ponderable matter.

Now, let us recall from previous analysis what led Einstein to this kind of thinking. The 1887 Michelson-Morley experiment, including its Fizeau-Fresnel precursors and its post-1887 confirmations, led Einstein and the rest of the world to believe that ether had no effect on objects because, as the experiments apparently proved, a light beam traveling with the Earth's velocity of 30 km/sec against the ether experienced no reduction in its speed when compared to a light beam that was not traveling against the ether. Rather than entertain the idea that the Earth was immobile, Einstein had two other alternatives: (a) that ether traveled with the Earth in its revolution around the sun; or (b) that there is no ether, and thus light itself is an absolute. Thus, the theory of Special Relativity was born, for if there is no ether, and all the heavenly bodies are in motion, then there is no absolute state of rest and no central point in the universe. Every object can act as its own inertial point. Each object will be subject to the same laws, and we, the observers, can understand how one object relates to the next only by means of the equations of Relativity theory. Thus, if Special Relativity can explain the mathematical relationships of these various objects, then there is no need for an ether, or, for that matter, there is no need for any fixed absolute, including a fixed Earth. Relativity makes the need for all absolutes superfluous. Accordingly, the confusing array of length contractions, time dilations, mass increases and gravitational warping seem much better ways of explaining the universe to the sophisticates of modern science than the simplified notion of a fixed Earth in a revolving sphere of stars.

Philipp Lenard was one of Einstein's most vocal opponents at this time. In a 1917 speech titled "Relativity Principle, Ether, Gravitation" he remarked that Einstein merely renamed ether as "space," and concluded that General Relativity theory could not exist without ether.[1089] Einstein responded with “Dialogue Concerning Accusations against Relativity Theory” in 1918.[1090]

[1089] "*Über Relativitätsprinzip, Äther, Gravitation,*" Leipzig, S. Hirzel, 1918, cited in Kostro.

Philipp Lenard
(1862 - 1947

In it we find Einstein basing his ideas on the aforementioned misinterpretation of the Michelson-Morley experiment, saying such things as: “According to the special theory of relativity a privileged state of motion did not exist anymore; this meant the negation of ether in the sense of earlier theories,” but he agreed with Lenard that the space of General Relativity had “physical properties.” Ernst Gehrcke had already introduced a critique of Einstein with the article “On Critics and History of the New Theories of Gravitation” in 1916,[1091] and Paul Weyland followed with a 1920 paper titled “Einstein’s Theory of Relativity as Scientific Mass Suggestion,” concluding that “Einstein eliminated the ether by decree, [but] he re-introduced it *via* a different concept with the same functions.”[1092]

After Einstein’s Leyden address in 1920 came the 1924 article titled *Über den Äther*. Einstein was on a quest to eliminate Lorentz’s immobile ether and replace it with a pliable ether. He needed ether, at least in some form, to answer Newton’s biggest problem: “action-at-a-distance.” As he says in *Über den Äether*: “We are going to call this physical reality, which enters into Newton’s law of motion alongside the observable ponderable bodies, the ‘ether of mechanics.’”[1093] Einstein knew that there could be no such “action” unless there existed a continuous medium to carry it from one place to another. As he says in the same work: “But every contiguous action theory presumes continuous fields, and therefore also the existence of an ‘ether.’”[1094] Since Einstein was convinced he could not have any object or place in the universe serve as an immobile point, this medium had to move. In Einstein's theory, it would move because matter moved it, yet it would be continuous because matter permeates the universe. As he describes it:

[1090] “Dialog über Einwande gegen die Relativitätstheorie,” *Die Naturwissenschaften* 6, 1918, cited in Kostro.

[1091] “Zur Kritik und Geschichte der neueren Gravitationstheorien,” *AdP*, 50, 1916, pp. 119-124, cited in Kostro. Gehrcke had also proved that Einstein plagiarized some of his work, specifically the 1898 mathematical work of Paul Gerber concerning the perihelion of Mercury (Kostro, *Einstein and the Ether*, p. 79).

[1092] “Einsteins Relativitätstheorie – eine wissenschaftliche Massensuggestion,” *Tägliche Rundschau*, August 6, 1920, as cited in Kostro.

[1093] *Über den Äether*, p. 85, as cited in Kostro, *Einstein and the Ether*, p. 103.

[1094] *Über den Äether*, p. 93, as cited in Kostro, *Einstein and the Ether*, p. 106. Also appearing in and translated from *Schweizerische naturforschende Gesellschaft,*

> No space and no portion of space [can be conceived of] without gravitational potentials; for these give it its metrical properties without which it is not thinkable at all….According to the general theory of relativity, space without ether is unthinkable; for in such space, not only would there be no propagation of light, but also no possibility of existence for standards of space and time (measuring rods and clocks), nor therefore any space-time intervals in the physical sense.[1095]

One can easily see the strain under which Einstein had put himself. He desperately wanted the ether because it would give him "standards of space and time," but he had not, and would never, as it develops, explain how he can possess such standards if both the matter and the ether it bends are constantly moving. Of course, we need only interject once again that, had Einstein properly interpreted the Michelson-Morley experiment, he would have had his "standard of space and time" in an immobile Earth.

Louis de Broglie
(1892 – 1987)

Even among Einstein's supporters the understanding that space is filled with substance was never relinquished. Louis de Broglie (d. 1987), the Nobel laureate famous for his discovery of the electron's wave in the 1920s, wrote in 1971 that the concept of ether, or as he calls it "the hidden medium," needed to be revived. Critiquing the model of space proposed by Erwin Schrödinger in 1926, de Broglie longs for the days of fixed points reminiscent of Descartes' Cartesian axes and Newton's absolute space:

Verhand-lungen, 105, 1924, pp. 92-93, and also appearing in Einstein's book, *The World as I See It*, 1934, "Relativity and the Ether," 1920, pp. 121-137, cited from *The Einstein Myth*, Part 1, p. 100. Einstein would write many other papers on the ether, such as "The New Field Theory" in 1929; "The Problem of Space, Ether and Field as a Problem of Physics" in 1934.

[1095] *Äther und Relativitätstheorie*, Berlin, J. Springer, 1920, pp. 13-14, Kostro, *Einstein and the Ether*, pp. 97-98.

> Everything becomes clear if the idea that particles always have a position in space through time is brought back…. According to my current thinking, the particle is always located within a physical wave….The movement of the particle is assumed to be the superposition of a regular movement…and of a Brownian movement due to random energy exchanges which take place between the wave and a hidden medium, which acts as a subquantum thermostat. The point of prime importance in this model is that at each moment the particle occupies a well-defined position in space, and this re-establishes the clear meaning which the configuration space had in classical mechanics.[1096]

Ludwik Kostro's book, *Einstein and the Ether*, has revealed the heretofore undisclosed history of ether science in the twentieth century. He states the following candid conclusion:

> Modern science has its roots in ancient Greek philosophy. This philosophy, as we know, used the word "ether" to designate the particular kind of matter that filled the universe. This term was used throughout the history of philosophy and science, and it

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[1096] Louis de Broglie, "Waves and Particles," *Physics Bulletin*, 22, February 1971, single page. In the same article he adds: "…whereas in my original concept I assumed that the coexistence of waves and particles, perceived by Einstein in 1905 in respect of light in his theory of light quanta, should be extended to all types of particle[s] in the form of the coexistence of a physical wave with a particle incorporated in it. Moreover, Schrödinger's ψ wave was soon to lose the nature of a physical wave on the day when Max Born put forward the hypothesis that it was a probability, and for that reason should be normalized, which is equivalent to assigning to it an arbitrary amplitude selected by the theorist. Thus, starting from a synthetic idea of the coexistence in physical space of waves and particles, a theory in which there was no longer any wave or particle was arrived at!….But as soon as Schrödinger's works were published I was struck by the paradox involved, as indeed I had already emphasized in an article which appeared in 1928 [Selected Papers on Wave Mechanics, London: Blackie, p. 130]. For since Schrödinger gave up the idea that particles existed in physical space, they no longer have well defined coordinates and it is difficult to imagine how the configuration space can be constructed with nonexistent coordinates….It may assist in clarifying this point to recall that in classical mechanics particles are treated as a first approximation as material points which have well defined coordinates in physical space at every moment….But this representation, clear and logical though it is, loses all its meaning in a theory in which particles have no spatial position as in current quantum mechanics" (*ibid*).

> was also current at the beginning of this century. A resumption of its use at the dawn of this new century is now a fact. Since, according to the General Theory of Relativity and other modern branches of physics, the space and time of the universe do not constitute a vacuum, but a structured material plenum characterized by different physical quantities, the historical and traditional word "ether" is the most appropriate to express these features of the universe.[1097]

Galine Granek adds:

> Einstein's new kind of ether was the metrical tensor field. He thus started to adhere to this new ether. He named it "Mach's ether" or simply "ether," and supplied the same reasons that Poincaré had provided in his writings as to why we should adhere to the ether (we need the ether in order to remove absolute rotation and action-at-a-distance: see my papers "Poincaré's ether"). Einstein thus returned to the 19th century concept of the ether, but stripped of it its most important characteristic: a medium being in absolute rest. One could still pose the perplexing question: Was Einstein's ether endowed with any properties independent of the masses in it? For if it did possess such properties then there was actually no difference between Einstein and Poincaré's ether. Einstein did not give a definitive answer to the above question in his (1920) lecture.[1098]

Astrophysicist Toivo Jaakkola extends Kostro's evidence:

> A few words about the gravitational ether, and the ether concept in general may be in place here. The ether hypothesis was thought to be buried by the Michelson-Morley experiment, but today it is more alive than ever, in the form of the CBR [Cosmic Background Radiation]: experiments capable of finding the ether were not possible in the 1880s, but were possible in the 1960s. In a sense, the electromagnetic ether has always been observed – as the heat of the Sun (since as pointed out, CBR is reprocessed photons).... All the main cosmological, astrophysical and

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[1097] Ludwik Kostro, *Einstein and the Ether*, 2000, pp. 186-187.

[1098] "Einstein's Ether: D. Rotational Motion of the Earth," Galina Granek, Department of Philosophy, Haifa University, Mount Carmel, Haifa 31905, Israel, *Apeiron*, Vol. 8, No. 2, April 2001, p. 64.

> physical facts: the gravity and Olbers paradoxes, redshift effects and CBR, gravitation and radiation, and the existence of particles can be conceived in the framework of this ether concept.[1099]

Everyone is seeing it. No more disparaging remarks about ether will be made from the science community today. As these authors put it: "Today the vacuum is recognized as a rich physical medium….A general theory of the vacuum is thus a theory of everything, a universal theory. It would be appropriate to call the vacuum "ether" once again."[1100]

In the end Einstein seems on the verge of resigning himself to failure. He even questions whether his Relativity theory is necessary, and, similar to Lorentz's letter written to Einstein in 1915 seeking a

> …'world spirit,' who would permeate the whole system under consideration without being tied to a particular place or 'in whom' the system would consist, and for whom it would be possible to 'feel' all events directly would obviously immediately single out one of the frames of reference over all others.[1101]

Einstein surprisingly refers to God and His alternate choices in a 1926 letter to Sommerfield:

> It is also necessary to criticize the fact that he [Eddington] often describes the theory of relativity as *logically* necessary. God could also have decided to create an absolute static ether instead of the relativistic ether. This would hold especially, if he were to adapt the ether to the (substantial) independence from matter, as in de Sitter, an opinion toward which Eddington obviously leans; because in such a case an "absolute" function should also be attributed to the ether.[1102]

[1099] "Action-at-a-Distance and Local Action in Gravitation," in *Pushing Gravity*, ed., Matthew Edwards, pp. 157-159.

[1100] S. Saunders, H. R. Brown, editors, *The Philosophy of Vacuum*, 1991, p. 251.

[1101] Henrick Lorentz to Albert Einstein, January 1915, Robert Schulmann, A. J. Kox, Michael Janssen and József Illy, editors, *The Collected Papers of Albert Einstein, Correspondence 1914-1918*. Princeton: Princeton University Press, 1998, Document 43.

[1102] Albert Einstein, "Letter to A. Sommerfield, 28/11/1926," in *A. Einstein, A. Sommerfield Briefwechsel*, Basel-Stuttgart: Schwabe u. Co. Verlag, 1968, p. 109, as cited in Kostro, *Einstein and the Ether*, p. 99.

Candidates for Material Ether: Carl Anderson's Positron

What science has found since the time of Einstein is a virtual sea of particles, both in the micro-levels and macro-levels of the cosmos, many of which are suitable candidates for the "ponderable" ether that Einstein dismissed because of his philosophical and scientific presuppositions. As noted above, the primary presupposition of which Einstein and all Copernican scientists were guilty is that they left no room to explain the interferometer experiments by means of a motionless Earth. Had they done so, it would have shown that something physical was there, even though they could not see, touch, hear, smell or taste it. That this kind of presupposition would lead to either a misinterpretation of the evidence, or even a downright denial of it, was brought out quite clearly in Einstein's interpretation of Carl Anderson's experiment in 1932. Anderson (1905-1991) was an American physicist who, with Victor Francis Hess of Austria, won the Nobel Prize for physics in 1936 for his discovery of the positron, the first known particle of "antimatter." In 1927, Anderson had begun studying X-ray photoelectrons (electrons ejected from atoms by interaction with high-energy photons). In 1930 he began research on gamma rays and cosmic rays. While studying photographs of cosmic rays in cloud-chambers, Anderson discovered a number of tracks whose orientation indicated they were caused by positively charged particles, but particles too small to be protons. In 1932 he announced that the particles were "positrons," particles with the same mass as electrons but positively charged. Paul Dirac had predicted their existence in 1928. Anderson's claim was controversial until it was verified the next year by the British physicist Patrick M. S. Blackett.

Carl David Anderson
(1905 – 1991)

Prior to Anderson, the electron was discovered in 1897 by J. J. Thomson; the proton in 1911 by Rutherford, Wein, et al., and the neutron in 1932 by James Chadwick. In 1937, Anderson would also discover the short-lived meson. Later came the discovery, although much of it theoretical, of about two hundred more nuclear particles, but most, like the meson, were unstable. The implications of Anderson's work, however, went far beyond the finding of just another subatomic particle. His discovery was another crossroads for science, perhaps equal to the 1887 Michelson-Morley experiment. As in 1887, everything depended on the *interpretation* given to the experiment. The wrong interpretation, which is inevitably based on the wrong presuppositions, would put all of science on the wrong track, and it could be decades, even centuries, before it would get back on the right track. As in the Michelson-Morley experiment, if science bases its interpretation on an unproven presupposition (*e.g.*, that the Earth is moving at 30 km/sec), then every subsequent experiment, whether on the micro- or macro-level, will be adversely affected, which has been the case with physics for quite a long time.

Carl Anderson's experiment was another example of such an occasion. In his discovery of the positron, Anderson found that when gamma radiation of no less than 1.022 million electron volts (MeV) was discharged in any point of space, an electron and positron emerged from that point.[1103] He also found the converse, that is, when an electron collides with a positron, the two particles disappear, as it were, and produce two gamma-ray quanta which disperse in opposite directions, but with a combined energy of 1.022 MeV. As one set of authors describe his discovery:

> On August 2, 1932, Anderson obtained a stunningly clear photograph that shocked both men. Despite Millikan's protestations, a particle had indeed shot up like a Roman candle from the floor of the chamber, slipped through the plate, and fallen off to the left. From the size of the track, the degree of the curvature, and the amount of momentum lost, the particle's mass was obviously near to that of an electron. But the track curved the wrong way. The particle was positive. Neither electron, proton, or neutron, the track came from something that had never been discovered before. It was, in fact, a "hole," although Anderson did not realize it for a while. Anderson called the new particle a "positive electron," but positron was the name that stuck. Positrons were the new type of matter – antimatter – Dirac had been forced to predict by his theory. (The equation, he said later, had been smarter than he was.)"[1104]

After the excitement of the discovery, of course, comes the interpretation. Often there is a vast gulf that separates the two. A viable interpretation of Anderson's discovery is that space is composed of a lattice of very stable electron-positron pairs which, when the proper quanta of radiation are administered, will either temporarily deform the lattice or jolt the electrons and positrons out of alignment and release them into the view of our bubble chambers. But there is one caveat for modern science: this particular interpretation contradicts both Einstein's theory of Relativity, which was well in vogue by 1932, and the Quantum Mechanical model of the atom known as the Standard Model. Since science almost invariably depends on the reigning paradigm to interpret new evidence (especially paradigms as strong as Relativity and Quantum Mechanics), a suitable counter-interpretation had to be created – one eliminating the possibility that space contained a material substance.

[1103] 1.022 MeV equals 3.9×10^{-19} calories.

[1104] Robert Crease and Charles Mann, "Uncertainty and Complimentarity," *World Treasury of Physics, Astronomy and Mathematics*, ed., T. Ferris, 1991, p. 78.

There were two men bold enough to apply this interpretation, Albert Einstein (to save Relativity) and Werner Heisenberg (to save Quantum Mechanics). Relativity theory holds that there is a physical relationship between energy and matter, as well as necessitating that space is a vacuum containing no "ponderable" ether. Thus Einstein had no choice but to conclude that the appearance and disappearance of the electron-positron pair was an example, as he called it, "of the creation and annihilation of matter." Moreover, with the ability to create and destroy electrons and positrons, the formula $E = mc^2$ now had its first "proof." Not only was there a mathematical relationship between matter and energy, but now there could be a relationship wherein energy could become mass, and mass could become energy. This became the standard interpretation of not only electrons and positrons, but of all subatomic particles that met their antimatter counterpart. Although this was pure speculation, these new interpretations did not seem to bother its authors. Let's revisit one of our earlier authors, Jonathan Katz, as he explains the electron-positron "creation" in regard to gamma-ray bursts:

> Einstein's equation $E = mc^2$ gives the amount of energy E that can be obtained if a mass m is completely turned into energy. This relation can be turned around: if two gamma rays with total energy E collide, they may produce a mass m. However, this is only possible if particles whose masses are m or less can be *created* (visible light cannot turn into matter because there are no particles with small enough masses). The least massive known particles are electrons (negatively charged) and positrons (positively charged), each with a mass corresponding to 0.511 MeV of energy. Because electric charge is never created or destroyed, electrons and positrons can only be *created* in pairs, one of each, with zero total charge. Two gamma rays, each of energy 0.511 MeV or more, colliding head-on, can therefore *produce* an electron-positron pair. If the collision is not head-on,

> then the necessary energy is greater. If the gamma rays have more energy than the minimum required, the extra appears as kinetic energy of the *newborn* matter – the electron and positron are *born* in motion.[1105]

As one can sense from reading Katz's description, the science establishment has given this explanation so often, and believed it for so many years, they have not the slightest doubt or embarrassment in saying that matter is created out of thin air. As if hypnotized, they entertain no other possibilities. This is a perfect example of how the evidence from experiment will invariably be interpreted by the scientific paradigm reigning at the time, in this case, the theories of Relativity and the Quantum Model of the atom.[1106] As Paul Dirac said in his 1933 Nobel Prize speech:

Paul Dirac
(1902 – 1984)

> To get an interpretation of some modern experimental results one must suppose that particles can be created and annihilated. Thus if a particle is observed to come out from another particle, one can no longer be sure that the latter is composite. The former may have been created. The distinction between elementary particles and composite particles now becomes a matter of convenience. This reason alone is sufficient to compel one to give up the attractive philosophical idea that all matter is made up of one kind, or perhaps two kinds, of bricks.[1107]

Actually, Dirac was being critical of the "creation" interpretation, but interpretations of this variety are still very popular today. Often, the more bizarre the theory, the better it sells to the media and the public at large. Various physicists have made a cottage industry out of such speculations. Stephen Hawking, for example, theorizes that in order to have higher than zero temperatures in black holes (a requirement to keep them stable), there must exist "virtual particles." According to Hawking, these are particles that "pop in and out of the vacuum of space spontaneously." Interestingly enough, Hawking holds that these "virtual particles" are mostly electron-positron pairs, and perhaps some proton-antiproton pairs. He writes:

[1105] Jonathan Katz, *The Biggest Bangs*, p. 46, emphasis added.

[1106] Besides the ignoring of the First Law of Thermodynamics, a rather glaring anomaly in the "creation/annihilation" theory is that the resulting electron and positron both have angular momentums equal to «/2 (*h* = Planck's constant). But this would necessarily mean that the electron or positron, respectively, would have 16 times (or 1,600%) more energy than the gamma photon that supposedly "created" it. Modern physics simply ignores the problem and refers to it as an "inherent property" of the process.

[1107] *World Treasury of Physics, Astronomy and Mathematics*, ed., T. Ferris, 1991, pp. 80-81.

> Quantum mechanics implies that the whole of space is filled with pairs of "virtual" particles and antiparticles that are constantly materializing in pairs, separating, and then coming together again and annihilating each other. These particles are called virtual because, unlike "real" particles, they cannot be observed directly with a particle detector. Their indirect effects can nonetheless be measured, and their existence has been confirmed by a small shift (the "Lamb shift") they produce in the spectrum of light from excited hydrogen atoms.[1108]

He explains their origin in another paragraph:

> When the universe was a single point, like the North Pole, it contained nothing. Yet there are now at least ten-to-the-eightieth particles in the part of the universe we can observe. Where did all these particles come from? The answer is that relativity and quantum mechanics allow matter to be created out of energy in the form of particle/antiparticle pairs. And where did the energy come from to create this matter? The answer is that it was borrowed from the gravitational energy of the universe.[1109]

Again, the more logical and less mystifying interpretation is that the electron-positron pairs are not created through force but were already present, and the radiation of the "black hole" is enough to jar them loose (that is, if black holes actually exist). This solution, of course, would be the death knell of the Big Bang theory, as well as Relativity and Quantum Mechanics.

[1108] *Black Holes and Baby Universes*, pp. 107-108.

[1109] *Black Holes and Baby Universes*, p. 97. In another place Hawking says that black holes "would be able to create electron-positron pairs and particles of zero mass" (*ibid*., p. 109). We notice, however, that Hawking doesn't tell us from where the gravitational energy originates if, according the General Relativity theory he is employing, there was no matter to warp space-time.

There is quite an intriguing story behind the "creation/annihilation" interpretation of Anderson's positron discovery. As noted, physicist Paul Dirac had predicted the discovery of the positron in 1928. In fact, his famous equation predicted that the entire universe is made up of electron-positron pairs (we will call them electropons, henceforth).[1110] The most unique aspect of Dirac's analysis was that his equation required two sets of electropon pairs, positive pairs and negative pairs.[1111] It was known as Dirac's "sea." For the Relativists who followed Einstein, Dirac's model, although everyone knew it was very workable, merely raised the stakes in the ongoing "ether-war," whose shots were first fired over forty years prior in the Michelson-Morley experiment (1887). In fact, in the same year that Dirac came out with his equation and through it predicted the positron's existence, Michelson was doing his final interferometer experiment to detect the ether that Dayton Miller had found four years earlier. Dirac's equation would be one more proof that Einstein incorrectly interpreted Michelson-Morley, the very experiment that hung Relativity in the balance.

Werner Heisenberg
(1901 – 1976)

This smell of ether was a stench in the nostrils of Relativists, but the budding science of Quantum Mechanics didn't much like the odor either. Werner Heisenberg did everything but hire an assassin to foil Dirac's work. He once referred to Dirac's work as "learned trash which no one can take seriously."[1112] Heisenberg got into the act because the stakes were raised high when Carl Anderson experimentally verified Dirac's 1928 prediction of the positron just four years later (1932). Something had to be done, and done quickly, to destroy Dirac's ether-based universe. For six years Heisenberg and his colleagues tried to find an error in Dirac's equation, but to no avail. Finally, they decided to create their own fudge factor.

[1110] Paul A. M. Dirac*, Proceedings of the Royal Society A*, 117, 610 (1928a); 118, 351 (1928b). P. A. M. Dirac, *Scientific American*, May 1963, p. 86. The equation took the form: $\sum_\beta [\sum_\mu (\gamma_\mu)_{\alpha\beta}\, \theta/\theta x^\mu + mc/\hbar\, \theta_{\alpha\beta}]\, \psi_\beta = 0$.

[1111] This is because the energy-momentum-mass relation of $E^2 = c^2p^2 + m^2c^4$ requires both a positive and negative energy, such that $\pm E = (c^2p^2 + m^2c^4)^{½}$. Some hypothesize that the 2.7° Kelvin radiation is the interface between the negative and positive energy.

[1112] Werner Heisenberg, Letter to Wolfgang Pauli, February 8, 1934.

Although Dirac's equation required the negative energy electropon pairs to be raised to positive energy pairs, Heisenberg circumvented this process by claiming that the positive energy pairs were merely "created" and had no origin from negative energy. Similarly, as Dirac's equation required the positive energy pairs to go back intermittently to the negative energy state, Heisenberg reinterpreted this to mean that the positive pairs were "annihilated." If there was any inadvertent crossover between the negative and positive, Heisenberg's quantum mechanics coined the words "vacuum fluctuation" or "Zero-Point fluctuation" to take care of that problem. Thus we have the dubious origin of the "creation/annihilation" interpretation of Carl Anderson's 1932 experiment and a case in which the politics and intrigue of the science establishment is revealed.

The significance of the electropon phenomenon is noted in how it reflects on the essence of the Big Bang theory, and the inevitable problems it creates. The standard theory is told to the popular enthusiast in the science magazine, *Discover*:

> Whenever a normal particle and an antiparticle meet, they annihilate each other, converting all their mass into energy in a pyrotechnic demonstration of Einstein's famous law, $E = mc^2$. And therein lies the source of one of the greatest dilemmas of science. Physicists believe that by the time the universe was just 10^{-33} of a second old…the temperature had dropped from unimaginably hot to a mere 18 million billion billion degrees. That was cool enough for the first particles of matter and antimatter to condense from pure energy. But to balance the cosmic energy books – and to avoid violating the most fundamental laws of physics – matter and antimatter should have been created in exactly equal amounts. And then they should have promptly wiped each other out. Yet here we are. Somehow a bit of matter managed to survive.[1113]

The article proceeds to report that the scientists working on this problem have no clue how to solve it. One team of scientists, although admitting that this theory is "extremely speculative" and has "no experimental evidence" to support it, proposes that the universe started with neutrinos that turned into electrons, positrons, protons and antiprotons, but finds that this solution “would have yielded more protons and antiprotons, leading to a fateful imbalance between matter and antimatter at the dawn of time,” to which his partner offers the consolation: “In the end there is irrefutable evidence that we are here.”[1114] Thank God for that.

[1113] Tim Folger, "Antimatter," *Discover*, August 2004, p. 67-68. *Discover* notes that "Andrei Sakharov was the first to understand that the Big Bang actually created a crisis for physicists: How could they explain the absence of antimatter and the presence of matter in a cosmos where both should have almost instantaneously vanished?" (p. 69).

Every time modern science tries to explain the present universe by relying on a process, the process fails to produce the universe they presently see. This is the perennial problem with the Big Bang theory: every twist and turn concocted to answer the anomalies it invariably confronts, invariably “violates the most fundamental laws of physics.” So either the new theories are wrong, or the “fundamental laws of physics” are wrong, or quite likely both are wrong. We can safely say, however, that when a theory is based on the idea that matter and energy are created out of thin air, then Middle Age alchemists and blood-letters are not as odd in comparison. Until men accept the fact that it was all brought into being simultaneously by an *ex nihilo* divine fiat, they will continue to go down the path of no return.

Arthur Compton (1892 – 1962)

The Anderson discovery was also important for another reason. It revealed that space consists of very dense yet very stable electropon pairings, perhaps in some type of lattice or crystalline structure. Someone in the physics community should have surmised that light traveling through this dense medium would be directly affected. Physics had already been prompted to think in this vein with Einstein’s Nobel Prize-winning discovery in 1905 of the photoelectric effect (the process by which a photon of the right frequency releases an electron from metal), as well as Arthur Compton’s discovery in 1923 of the process by which a photon gives momentum to an electron, appropriately called the “Compton effect.” With the knowledge that light can be affected by, and produce, physical effects when it interacts with atomic particles, then observing consistent interferometer results of 1-4 km/sec over the course of more than 60 years (*i.e.*, 1867-1932) should have suggested to them that light was being physically affected by some kind of substance in space. Unfortunately, as we know all too well, strong but unproven presuppositions (*i.e.*, that the Earth was revolving around the sun at 30 km/sec) prohibited them from making that crucial link.

[1114] “Antimatter,” *Discover*, August 2004, p. 71.

Another possible reason for modern science's reluctance to accept that electropon pairs already exist and are not "created" is that it would force a wholly different explanation to such formulas as $E = mc^2$, explanations that are not dependent on Lorentz's complex transformation equations or Einstein's canons of tensor calculus. In other words, the alternative explanations would be physical, mechanical, and anti-Relativistic. That is, energy (E) is absorbed into open space resulting in the release of a mass of electrons and positrons (or various other possible particles), which can then be multiplied by the square of the speed of light to calculate the total amount of energy absorbed. In fact, accepting the electropon lattice model, one can arrive at $E = mc^2$ by a simple algebraic proportion.[1115]

That an electropon lattice may pervade all of open space and thus constitute the salient part of the "ponderable" ether has been postulated for quite some time. Plasma physics, for example, has demonstrated that electropon pairs play an important role in almost every phenomenon in the cosmos, including stars, neutron-stars, pulsars, quasars and gamma-ray bursters.[1116] Based on much physical evidence, several physicists have shown that an electropon lattice provides one of the most logical, lucid, and thoroughly physical explanations for nuclear and cosmological phenomena. Despite the unfortunate theoretical detour to which science drove itself after the 1887 Michelson-Morley experiment, there are a few modern scientists who haven't succumbed to the *hocus pocus* of spatial warps, time dilations, and quantum uncertainties. All the mystery and confusion created by Relativity and Quantum Mechanics is suddenly evaporated once one understands the *physical* reasons (as opposed to the merely mathematical or theoretical) why things occur as they do.[1117] For example, the origin of inertia could be simply explained, since around every micro and macro object there are billions of electropon pairs, which vibrate at a frequency proportional to the velocity of the object. If the object remains in uniform motion, so does the vibration energy of the electropon pairs. If there is any change in motion, the electropon pairs act accordingly, changing their frequency and energy. The energy required to change the values for the electropon pairs is equivalent to the inertial energy of the object. The same principle could hold for gravity. Any two bodies will disturb the equilibrium of the electropon pairs, and will do so based on their masses and the inverse square of the distance between them. Since the disturbance occurs between the bodies, the force will be felt there, and nowhere else.[1118] In fact, because the electropons are in a lattice formation, they function very similar to crystalline structures. In light of this comparison, Robert Laughlin sheds some light as to how such crystalline structures transmit their energy:

[1115] If the product 300,000 km/sec is caused by the velocity (v) of the wave motion of the electropon lattice, then $v = (E/m)^{½}$ where m equals the mass of the electron or positron (9.1×10^{-31} kg), and E is the binding energy per particle (511,000 eV or 8.2×10^{-14} joules), the equation is: $v = (8.2 \times 10^{-14} \text{ joules}/ 9.1 \times 10^{-31} \text{ kg})^{½} = (9 \times 10^{16} \text{ m}^2/\text{s}^2)^{½} = 3 \times 10^8$ m/s = 300,000 km/s = c, the accepted "speed" of light. Since $c = v$ in $v = (E/m)^{½}$, then $E = mc^2$. (See M. Simhony, *An Invitation to the Natural Physics of Matter, Space, Radiation*, Singapore, New Jersey: World Scientific, 1994, pp. 172-175).

[1116] *Electron-Positron Physics at the Z*, "Series in High Energy Physics, Cosmology and Gravitation," M. G. Green, Royal Holloway and Bedford College, UK, January 1998. Plasma experimenters spend most of their time colliding electrons and positrons at just below luminal speeds producing an array of other strange particles. In fact, different particles are produced depending on how fast the electrons and positrons collide. Whether these are true particles or merely different bubble-chamber paths of the same particle remains on the debating table.

> The ability of electrons and holes to move ballistically through the lattice is not obvious at all….The resolution of this problem is that the entanglement is rendered irrelevant by emergence. It

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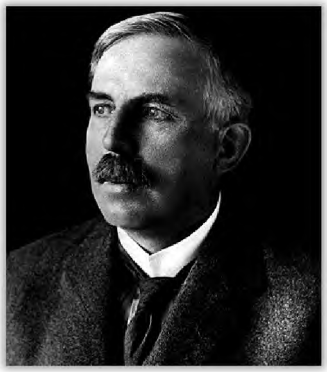
[1117] Among the many contributors, Menahem Simhony has developed one of the most comprehensive explanations of matter, space, and energy. From the results of the 1932 discovery of the positron, Simhony's model is based on the concept of an electron-positron cubical lattice comprising all of open space. Simhony holds that the density of the electron-positron pairs in space is 6×10^{30} cm^3. This is precisely the same value found by another researcher in the field, Allen Rothwarf, although the two scientists worked independently (Allen Rothwarf, "Cosmological Implications of the Electron-Positron Ether," *Physics Essays*, 11, 1998). John Kierein finds a similar density to the electron-positron model, and by it shows that redshift is due to the Compton effect (John Kierein, "Implications of the Compton Effect Interpretation of the Redshift," *IEEE Trans. Plasma Science* 18, 61 (1990). Simhony puts forth physical answers to gravity (p. 129), electromagnetism (p. 92), inertia (pp. 124, 212, 222), momentum (p. 162), the wave-particle duality (p. 163), the speed of light and superluminal speeds (p. 209), redshift (pp. 223, 249, 252), why atoms do not collapse (p. 193), evidence against the Big Bang and expanding universe (pp. 241, 245-247, 254), black holes (p. 244), etc. Simhony, however, misinterprets the Michelson-Morley experiment, and therefore fails to equate the electron-positron pairs as a constituent part of the ether detected by the interferometer experiments (See M. Simhony, *An Invitation to the Natural Physics of Matter, Space, Radiation*, 1994).

[1118] Coulomb's law says the attractive force between the electron and positron is 42 orders (10^{42}) higher than the gravitational force, so these are very stable pairings.

> turns out to be exactly and universally the case that crystalline insulators have specific collective motions of isolated electrons that look and act as though they were motions of isolated electrons….The important thing is that the particle-like nature of the collective motion is exact and reliable.[1119]

As for magnetism, a free moving electron will simply attract the positron end of an electropon pair. Thus, as Maxwell wrote in 1873:

> From the hypothesis that electric action is not a direct action between bodies at a distance, but is exerted by means of the medium between the bodies, we have deduced that this medium must be in a state of stress.[1120]



Ernest Rutherford (1871 – 1937)

At the least, there are viable, physical, solutions at our disposal. Unfortunately, most physicists still think that the particles appearing in electropon collisions are created out of thin air, rather than being released from it, since opting for the latter would mean that space is substantive and that science has to go back to the drawing board.

In line with these insights is the discovery in 1911 by Ernest Rutherford when he bombarded very thin sheets of gold with alpha particles. He found that, even though alpha particles are 8,000 times larger than the electron, and the metal foil was 400-atoms-thick, nevertheless, most of the particles penetrated the foil with little problem. Only a few, perhaps 1 in 1,000, were scattered, some deflected 90 degrees, others 180 degrees. A viable interpretation of this phenomenon is that the alpha particles move through the atom as if it were almost completely empty. The few alpha particles that were deflected had done so because they hit the nucleus of the atom, which means that most of the mass and electric charge of the atom are concentrated at that central point. As it turns out, only a quadrillionth of the atom has mass. The rest is "empty space," whatever one conceives that to be.

[1119] Robert B. Laughlin, *A Different Universe*, p. 66.

[1120] James Clerk Maxwell, *A Treatise on Electricity and Magnetism*, 142, 670, 1873. Maxwell also said: “There can be no doubt that the interplanetary and interstellar spaces are not empty but are occupied by a material substance or body, which is certainly the largest, and probably the most uniform body of which we have any knowledge.”

Naturally, Rutherford's results bring up some intriguing questions that are not often given the proper spotlight. If only 0.000,000,000,01% of the typical atom is occupied by particles, what constitutes the other 99.999,999,999,99%? For lack of a better term, modern science calls it "empty space," but what is empty space? We are back to our philosophical question introduced at the beginning of this chapter: Can "nothing" exist? It will do no good for the Relativist to appeal to General Relativity, for the fact remains that Rutherford's alpha particles did not go through a time warp or a spatial curvature but through the "absolute" space between the nucleus and the swirling electrons of the atom.

Since the time of Rutherford, science has penetrated even farther into the atom. By the time we get down to quarks and leptons (the theoretical components of protons and neutrons), we are at dimensions of 10^{-18} centimeters in length, as opposed to 10^{-12} cm for the atom itself.[1121] But we are still left with the "empty space." Could this "empty space" be filled with particles even smaller than a length of 10^{-18} cm? Perhaps the electropon pairings constitute much of open space, but even then it looks like we need some help in packing the rest of the space with something even smaller.

The Ether of Quantum Mechanics and String Theory

Ever since the dawn of quantum mechanics (a theory to which Einstein was bitterly opposed because any assignment of ponderable substance to space would explicitly contradict General Relativity), most of today's physical theorists hold that inner and outer space hold a dizzying array of particles and/or fields. One scientist, Josef Tsau, believes that the universe is bathed in a primary ether particle, the neutrino. Although they have mass, neutrinos are extremely small entities. They can apparently travel through the empty space of the atom and do so at the speed of light. Having no charge, they can only affect other masses by their high kinetic energy. Fifty trillion of them are said to pass through our human body every second. Tsau has developed a whole science of physics based on how the neutrino interacts with atomic particles, explaining everything from gravity to how light travels to how planets revolve around the sun.[1122]

[1121] Some accelerators have produced evidence of "pentaquarks," a collection of five different quarks, but the same evidence leads to the theory that there may be a dozen or more species of pentaquarks (J. R. Minkel, "The Power of Five," *New Scientist*, July 3, 2004, p. 32).

Even smaller particles are discussed by other scientists. Different names are given to these entities (*e.g.*, gravitons, maximons, machions, etherons, axions, newtonites, higgsionos, fermions, bosons, zero-point energy field, material vacuum, cosmic false vacuum). Popular String theorist, Brian Greene, speaks of them as "modern echoes…of a space-filling ether." He writes:

> We then encounter subsequent discoveries that transformed the question once again by redefining the meaning of "empty," envisioning that space is unavoidably suffused with what are called quantum fields and possibly a diffuse uniform energy called a cosmological constant – modern echoes of the old and discredited notion of a space-filling ether.[1123]

It has been known in modern science for quite some time that there exists a world permeating all of space that consists, perhaps, of the smallest functional dimensions known to man. As one author puts it:

> Classically, a vacuum is simply the absence of matter. In quantum mechanics, however, the [Heisenberg] uncertainty principle leads us to view the vacuum as a very complex system. A particle-antiparticle pair can pop into existence in empty space, provided that the two annihilate each other in a time so short that the violation of energy conservation implicit in this process cannot be detected. The vacuum, then, is more like a pan of popcorn than a featureless, empty sea. Particle-antiparticle pairs pop into existence here and there, but disappear quickly.[1124]

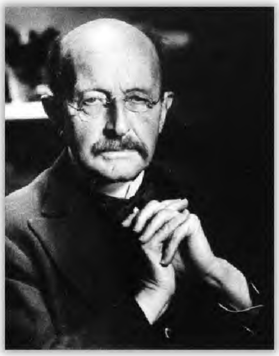
[1122] Josef Tsau, *Discovery of Aether and its Science*, 2005. It is Tsau's belief that a neutrino wind generated by the sun pushes the planets in their orbital paths, thereby answering the mysterious phenomenon of inertia. He writes: "The high energy neutrino particles produced by the dense-matter object of the Sun affected by its rapid rotation and the strong force fields created by the rotation may form a constant spiral neutrino-particle wind that provides a directional pushing effect only, which may cause the outer layer of the Sun to rotate and is utilized by all planets to stay in orbit. If a planet is orbiting in the right direction, such a spiral wind at equilibrium would constantly give it a push in both its orbiting and anti-gravity directions to keep it in orbit" (p. 22).

[1123] Brian Greene, *The Fabric of the Cosmos*, 2004, Preface, p. x. Brian Greene has also written the popular book, *The Elegant Universe*.

[1124] James Trefil, "The Accidental Universe," *Science Digest*, June 1984, p. 100.

Nobel laureate Robert Laughlin shows us a little more of the history behind this discovery:

> The existence and properties of antimatter are profoundly important clues to the nature of the universe….The simplest solution – and the one that turned out to be experimentally correct – was to describe space as a system of many particles similar to an ordinary rock. This is not a precisely correct statement, since Paul Dirac formulated the relativistic theory of the electron…but in hindsight it is clear that they are exactly the same idea…. This…has the fascinating implication that real light involves motion of something occupying the vacuum of space….The properties of empty space relevant to our lives show all the signs of being emergent phenomena characteristic of a phase of matter.[1125]



Max Planck
(1858 – 1947)

As we see, there is a whole other realm of particle-antiparticle pairs besides those of electropons. Quantum mechanics can only measure the effects of the particles. It does not know what the particles are, nor can it accurately predict what these particles will do in every case (as opposed to being able to predict what atoms will do). As noted above, quantum scientists refer to them as particles that "pop in and out of existence."[1126] The only thing they know for sure about them is that the First Law of Thermodynamics cannot be violated, and thus, in one zepto-second the particle is here, and in the next it must be gone, but to where no one knows.

Most of this strange, unseen world comes in what science knows as "Planck" dimensions, named after the physicist Max Planck due to his formulation of the quantum « the smallest unit of energy.

[1125] Robert B. Laughlin, *A Different Universe*, pp. 103-105.

[1126] As one popular magazine put it: "…according to quantum mechanics, empty space is not empty. Rather, the vacuum is filled with fields and particles that constantly pop in and out of existence. The problem is that when physicists estimate how much energy is contained within those fields and particles, they come up with a number…that is insanely large, 10^{120} times greater than what we observe" (*Discover*, October 2005, p. 56).

It is in this world that lengths come as small as 10^{-33} cm; mass as ethereal as 10^{-5} grams; and time as short as 10^{-44} seconds. Comparing the Planck length to the size of an atom (10^{-13} cm) or an electron (10^{-20} cm), a Planck particle (which we call "plancktons," henceforth) is 100,000,000,000,000,000,000 times smaller than the former and 1,000,000,000,000 times smaller than the latter. You can visualize its smallness by this analogy: if a drop of water were the size of Earth, an atom would be the size of a basketball, and a planckton would be about the size of the electrons in the basketball.[1127]

How does modern science know plancktons exist? The logic of quantum physics leads them there. As Stephen Hawking puts it:

> [T]he uncertainty principle means that even "empty" space is filled with pairs of virtual particles and antiparticles…(unlike real particles, they cannot be observed directly with a particle detector)….If it weren't – if "empty" space were really completely empty – that would mean that all the fields, such as the gravitational and electromagnetic fields, would have to be exactly zero. However, the value of a field and its rate of change with time are like position and velocity of a particle: the uncertainty principle implies that the more accurately one knows one of these quantities, the less accurately one can know the other. So if a field in empty space were fixed at exactly zero, then it would have both a precise value (zero) and a precise rate of change (also zero), in violation of that principle. Thus there must be a certain minimum amount of uncertainty, or quantum fluctuations, in the value of the field.[1128]

As we noted earlier, these particles are said to be continually "popping in and out" of space. In fact, as modern science interprets the appearance and disappearance of electropon pairs to be an example of the creation and annihilation of matter, they make a similar interpretation in explaining why plancktons appear and disappear in 10^{-44} seconds. To explain their appearance some physicists have gone to the extreme of saying that these particles come from other universes or dimensions,

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[1127] The Planck length is derived from the formula √(G «/c^3), where G is the gravitational constant, «is Planck's constant of angular momentum, and *c* is the speed of light. This may be the fundamental length that would prohibit further division on an actual, not potential, basis. For further study, see V. L. Ginzburg, *Key Problems of Physics and Astronomy*, Moscow, Mir Publishers, 1976.

[1128] Hawking, *A Briefer History of Time*, pp. 122-123.

John A. Wheeler
(1911 – 2008)

visiting us for very brief "Planck" periods.[1129] In that sense also they are understood as "virtual" particles, not real particles.

In 1957, Princeton professor John Wheeler was the first to describe this phenomenon as "space-time foam" – a universe of virtual particles appearing and disappearing in Planck time through blackholes.[1130] Ironically, Wheeler was also quoted as saying that blackholes were "the greatest crisis ever faced by physics."[1131]

Stephen Hawking supports Wheeler's theory, stating that, on extremely small scales in the Planck dimensions, space is alive with "turbid random activity and gargantuan masses," while "wormholes" provide passage to other universes.[1132] Others, such as Ian Redmount and Wai-Mo Suen speak of "quantum space-time foam" or "Lorentizian space-time foam,"[1133] as does S. J. Prokhovnik.[1134] F. Selleri understands the CMB as the fundamental reference frame, pointing out that any object that travels through it is affected by radiation pressure.[1135] Jean-Pierre Vigier refers to it as a "non-empty vacuum" and outlines the phenomenon of superluminal interactions in an "underlying deterministic substructure."[1136] Vigier points to the experiments by Alain Aspect, which confirm the results.[1137] Robert Moon, professor emeritus in physics at University of Chicago, adds:

[1129] MIT physicist, Alan Guth, and Russian physicist, Andrei Linde.

[1130] John A. Wheeler and C. M. Patton, "Is Physics Legislated by Cosmology?" *The Encyclopedia of Ignorance*, editors: Ronald Duncan and Miranda Weston-Smith, *Pocket Books*, 1978, pp. 19-35.

[1131] "Those Baffling Black Holes," *Time*, Sept. 4, 1978. In another venue, Wheeler commented: "To me, the formation of a naked singularity is equivalent to jumping across the Gulf of Mexico. I would be willing to bet a million dollars that it can't be done. But I can't prove that it can't be done" (*Computer Defies Einstein's Theory*, by John Wilford, New York Times, March 10, 1991).

[1132] *Black Holes and Baby Universes and Other Essays*, Bantam, 1994; *A Briefer History of Time*, pp. 104-123.

[1133] *Physical Review D*, 3rd series, vol. 47, No. 6, March 1993; I. Redmount and W.-M. Suen, "Is Quantum Spacetime Foam Unstable?" *Rapid Communication, Physical Review D*, 47, 2163 (1993); "De Broglie Waves on Dirac Ether," *Lettere Al Nuovo Cimento*, vol. 29, No. 14, Dec. 1980; W.-M. Suen, "Minkowski Spacetime is Unstable in Semi-Classical Gravity," *Physical Review Letters*, 62, 2217 (1989).

[1134] S. J. Prokhovnik, "Light in Einstein's Universe," Dordrecht, Reidel, 1985; "A Cosmological Basis for Bell's View on Quantum and Relativistic Physics," in *Bell's Theorem and the Foundation of Modern Physics*, eds., A. Van der Merwe, F. Selleri, G. Tarozzi, New Jersey, World Scientific, 1990, pp. 508-514.

> According to accepted theory, free space is a vacuum. If this is so, how can it exhibit impedance? But it does. The answer, of course, is that there is no such thing as a vacuum, and what we call free space has structure. The impedance equals 376+ ohms."[1138]

Many theorists appeal to ultra small particles to explain the phenomenon of gravity, which has hitherto defied the efforts of modern science to uncover its physical mechanism. In trying to explain gravity as a process of interacting particles, the "empty space" of the cosmos is said to be filled with particles going by such names as "gravitons," "machions," "messenger particles," or "force-carrier particles." Included among these particles are electropon pairs, which are said to have a time-scale existence of 10^{-21} seconds. Another explanation, going by the name of String Theory, holds that, rather than space being filled with point particles, it consists of one-dimensional "strings" that are 10^{-33} cm in length. The particles we are detecting are merely oscillations of the strings. This theory requires the existence of 10 or more dimensions to make everything fit, which are given various exotic names such as "Calabi-Yau manifolds."[1139]

Other discoveries have also added to the mystery. In 1948 Hendrik Casimir discovered that two mirrors facing each other in a perfect vacuum have a mysterious force acting upon them that draws them together, which is appropriately called "the Casimir effect."[1140] This is a force that seems to appear out of nowhere, since in a vacuum there would be no obvious forces or material substances carrying them, yet a force it was. Current science tries to explain the appearance of this force as a "vacuum fluctuation" wherein the aforementioned "virtual particles" do their magic, but this is merely theoretical phraseology for something they really don't understand. One interesting theory held by the editor of the *Astrophysical Journal*, Bernard Haisch, is that the Casimir effect shows the existence of a "zero-point field" and is the scientific fulfillment of the opening verses of Genesis 1:3, "Let there be light."[1141] Although Haisch's exuberance may

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[1135] F. Selleri, "Space-time Transformations in Ether Theories," *Z. Naturforsch*, 46a, 1990, pp. 419-425.

[1136] J. P. Vigier, "Causal Superluminal Interpretation of the Einstein-Podolsky-Rosen Paradox," and "New non-zero photon mass interpretation of Sagnac effect as direct experimental justification of the Langevin paradox," *Physics Letters A*, 234, 1997, pp. 75-85; *Physics Letters A* 175, 1993, p. 269.

[1137] *Physical Review Letters*, vol. 49, No. 2, July 12, 1982.

[1138] "Space Must Be Quantizied," *21st Century*, May-June, 1988, p. 26ff.

[1139] Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality*, New York: Alfred A. Knopf, 2004, p. 369.

[1140] Hendrik B. G. Casimir, Proc. Kon. Ned. Akad. Wetensch. B51, 793, 1948; S. Lamoreaux, *Physical Review Letters*, 78, 5, 1996; M. Bordag, U. Mohideen and V. M. Mostepanenko, "New developments in the Casimir effect," *Phys. Rep.* 353

1, 2001; H. B. Chan, et al., "Nonlinear micromechanical Casimir oscillator," *Physical Review Letters* 87, 211801, 2001; F. Chen and U. Mohideen, "Demonstration of the lateral Casimir force," *Physical Review Letters* 88, 101801, 2002; C. Genet, A. Lambrecht and S. Reynaud, "Temperature dependence of the Casimir force between metallic mirrors," *Physical Review* A 62 012110, 2000; K. Lamoreaux, "Demonstration of the Casimir force in the 0.6 to 6 micrometer range," *Physical Review Letters* 78 5, 1997; K. A. Milton, *The Casimir Effect: Physical Manifestations of Zero-point Energy*, World Scientific, Singapore, 2001. The Casimir Effect also causes one to wonder whether the Gravitational constant *G* in Newton's force equation [$F = Gm_1m_2/r^2$] is, indeed, caused by gravity or some other force, since its value was determined in 1798 based on the attraction of metallic spheres in close proximity to one another. Stephen Mooney holds that the Cavendish Torsion Balance measures electrostatic attraction, not gravitational attraction. He points out that when Cavendish conducted the test, he found perplexing the fact that the attraction between the two spheres increased when he heated the larger of the two. Mooney believes the reason is that Cavendish was measuring the radiation density at the Earth's surface (which is not a constant value), not gravitational attraction (Stephen Mooney, "From the Cause of Gravity to the Revolution of Science," *Apeiron*, vol. 6, no. 1-2, pp. 138-141, 1999). Science is not agreed on the value of G in any case. Most disagree on its value after only three decimal places, and some disagree even after one decimal.

[1141] Bernard Haisch, scientific editor of *The Astrophysical Journal* and editor-in-chief of the *Journal of Scientific Exploration*, has postulated that the Casimir Effect is due to the exclusion of the zero-point field from the gap between the plates, which was worthy enough to be published by *Physical Review*, (B. Haisch, A. Rueda, and H.E. Puthoff, Physical Review A, 49, 678, 1994. In an article in *Science and Spirit Magazine* titled "Brilliant Disguise: Light, Matter and the Zero-Point Field," Haisch coincides his findings with Genesis 1:3's "Let there be light." Haisch holds that the zero-point energy field results when, due to the Heisenberg Uncertainty Principle which says that there will be continual random movement in electromagnetic waves, if all the energy in those random movements are added up, it will produce the "background sea of light whose total energy is enormous: the zero-point field. The 'zero-point' refers to the fact that even though this energy is huge, it is the lowest possible energy state." Other articles include: "BEYOND $E=mc^2$: A First Glimpse of a Post-modern Physics in Which Mass, Inertia and be somewhat misplaced, it is obvious that he knows *something* is there, and it is far smaller than the dimensions we see on the atomic level. Accordingly, other physicists recognize that it is high-time Einstein's theories about gravity be replaced.[1142] All these discoveries spell a certain doom for the theories of Einstein because, try as they may, no one has been able to bridge the huge gap between Relativity and the Quantum world in which these particles are created and catalogued. In fact, Roger Penrose, who has coined the word "twistors" for his particles of choice, has stated that the concept of "space-time" may be eliminated from the basis of physical theory altogether.[1143] Abhay Ashtekar holds that at the Planck scale the concept of space-time is replaced by a network of what he calls "loops and knots" of energy. This theory is being further developed by Carlo Rovelli and Lee Smolin.[1144]

Gravity Arise from Underlying Electromagnetic Processes," B. Haisch, A. Rueda and H. E. Puthoff, *The Sciences*, November/December, Vol. 34, No. 6, pp. 26-31, 1994; B. Haisch, A. Rueda and H. E. Putoff, "Inertia as a Zero Point Field Lorentz Force," *Physical Review* A, Vol. 49, No. 2, 1994; B Haisch and A. Rueda, "Electromagnetic Zero-Point Field as Active Energy Source in the Intergalactic Medium," presented at 35th Jet Propulsion Conference, June 1999. "Vacuum Zero-Point Field Pressure Instability in Astrophysical Plasmas and the Formation of Cosmic Voids," A. Rueda, B. Haisch and D. C. Cole, *Astrophysical Journal*, 445, 7, 1995; Puthoff, H.E., "Gravity as a Zero Point Fluctuation Force", *Physical Review* A, Vol. 39, No. 5, 1989; R. Matthews, "Inertia: Does Empty Space Put Up the Resistance?" *Science*, Vol. 263, 1994.

[1142] H. Yilmaz, "Towards a Field Theory of Gravitation," *Il Nuovo Cimento*, Vol. 107B, no. 8, 1991; I. Peterson, "A New Gravity? Challenging Einstein's General Theory of Relativity," *Science News*, Vol. 146, 1994; J. P. Siepmann, "The Laws of Space and Observation," *Journal of Theoretics*, Vol. 1, No. 1, 1999.

[1143] Roger Penrose, *The Road to Reality: A Complete Guide to the Laws of the Universe*, New York, Alfred Knoph, 2005, pp. 968-1002.

[1144] Lee Smolin, "Atoms of Space and Time," *Scientific American*, Sept. 2004; A. Ashtekar, V. Husain, J. Samuel, C. Rovelli, L. Smolin: "2+1 quantum gravity as a toy model for the 3+1 theory," *Classical and Quantum Gravity* 6, L185, 1989; C. Rovelli: "Loop space representation In: New perspectives in canonical gravity," A. Ashtekar Bibliopolis, Naples 1988; C. Rovelli and L. Smolin: "Knot theory and quantum gravity," *Physical Review Letters* 61, 1155, 1988; C. Rovelli, L. Smolin: "Loop space representation for quantum general relativity," *Nuclear Physics* B331, 80, 1990; A. Ashtekar, C. Rovelli, L. Smolin: "Gravitons and loops," *Physical Review* D44, 1740, 1991; A. Ashtekar, C. Rovelli: "Connections, loops and quantum general relativity," *Classical and Quantum Gravity* 9, 3, 1992; J. Iwasaki, C. Rovelli: "Gravitons from loops: non-perturbative loop-space quantum gravity contains the graviton-physics approximation," *Classical and Quantum Gravity* 11, 1653, 1994; H. Morales-Tecotl and C. Rovelli: "Loop space representation of quantum fermions and gravity," *Nuclear Physics* B 451, 325, The seeming inevitable position to which science is being led is that there is a world of activity occurring at Planck dimensions that underlies everything that happens in the universe. Obtaining the right understanding of this Planck universe will ultimately set aside both Relativity and Quantum Mechanics. Even staunch Relativists admit this eventuality. As Alan Kostelecký writes in *Scientific American*: "The observable effects of Planck-scale Relativity violations are likely to lie in the range of 10^{-34} to 10^{-17}."[1145] Kostelecký more or less admits that, even though the ultimate theory of nature lies in these tiny dimensions, current science is at a loss to investigate them:

> Whatever the eventual form of the ultimate theory, quantum physics and gravity are expected to become inextricably intertwined at a fundamental length scale of about 10^{-35} meters, which is called the Planck length, after the 19th century German physicist Max Planck. The Planck length is far too small to be within the direct reach of either conventional microscopes or less conventional ones such as high-energy particle colliders (which probe "merely" down to about 10^{-19} meter).[1146]

The magazine itself adds:

> In quantum physics, short distance and short times correspond to high momenta and high energies. Thus, at sufficiently high energy – the so-called Planck energy – a particle should "see" the graininess of spacetime. That violates relativity, which depends on spacetime being smooth down to the tiniest size scales.[1147]

1995; C. Rovelli and L. Smolin: "Spin Networks and Quantum Gravity," *Physical Review* D 53, 5743, 1995; gr-qc/9505006. Lee Smolin argues that space is proportional to the area of its boundary in Planck units establishes a fundamental limitation on the nature of physical systems, called the "Bekenstein" bound. The power of this principle lies in its universality—any viable theory of quantum gravity must explain why it holds ("Three Roads to Quantum Gravity," Basic Books, 2001).

[1145] Alan Kostelecký, "The Search for Relativity Violations, " *Scientific American*, September 2004, p. 96.

[1146] *Ibid.*

[1147] Graham P. Collins, staff writer, *Scientific American*, Sept. 2004, p. 99. NB: We are not here supporting the concept of "space-time," but merely using the same terminology of modern science as they discover the contradictions and anomalies in their own theories.

It predicts the same doom, however, for Quantum Mechanics itself:

> Still, something is rotten in the state of quantumland, too. As Einstein was among the first to realize, quantum mechanics, too, is incomplete. It offers no reason for why individual physical events happen, provides no way to get at objects' intrinsic properties and has no compelling conceptual foundations.[1148]

In Quantum Land, virtual particles can do just about anything the theorist desires they do, including traveling faster than the speed of light or escaping from a black hole. There is one catch, though. The math of Quantum Mechanics maintains that, if they travel faster than the speed of light, they better "pop out of existence" prior to any violation of the Heisenberg Uncertainty Principle, otherwise, they cannot exist.

In the end, those who depend on "virtual" particles with word pictures such as "space-time foam" or "non-empty vacuum" have admitted, however, that the whole system of "virtual" particles is doomed from the start. Redmount and Suen have shown that if plancktons are left in the "pop in and pop out" category it creates numerous anomalies in the structure of the quantum field, including but not limited to "wormholes" on an intolerable scale.[1149] This leads one to posit that the plancktons should be understood as real particles, the underlying substance of the Genesis firmament itself. We will cover this possibility momentarily.

String Theory: Seeking to Bridge Relativity and Quantum Mechanics

As we noted, some have even entertained the idea that other universes exist in different dimensions, universes that sometimes interact with our universe by sharing virtual particles with us. In a rather amusing assessment of current theories, *Popular Science* editor Michael Moyer describes his trip through the maze of quantum mechanics:

> Things happen in more than three dimensions of space; to see them in only three is to succumb to a trick that the universe is constantly playing on us….Type of possible space #1: A 10-dimensional universe made up of the normal three dimensions of space, plus one of time, plus six-dimensional Calabi-Yau

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[1148] George Musser, "Was Einstein Right," *Scientific American*, Sept. 2004, p. 89.

[1149] I. Redmount and W.-M. Suen, "Is Quantum Spacetime Foam Unstable?" *Rapid Communication, Physical Review D*, 47, 2163, 1993.

manifolds…I'm not making this up. I am only attempting to report to you, dear reader, what I have heard smart people say….When scientists talk about extra dimensions, they actively avoid the use of English….So they use the language of math, whose concepts and terms are easily generalized into any number of dimensions or spaces or inconceivable, unphysical situations …string theory carries with it great hope for both particle physics…and cosmology. Both are beset with problems, "problems" here meaning deep chasms of ignorance in our understanding of the physical world…

Type of possible space #2: The universe as we know it is merely a three-dimensional brane suspended in a four-dimensional bulk. What the %$#& is a brane?…You live on a brane. A brane is like a membrane. Imagine the skin that forms on your soup when it gets cold. A brane is like that….Like so much congealed fat, we are prevented from escaping the brane and going into the higher dimensional soup. Only gravity is allowed to do that. The problem that had been confounding all of these smart people for so long (and continues to confound them; did I mention that none of what I'm describing has yet been supported by a shred of experimental evidence?) was this: Gravity is weak…. Everything else works fine; gravity is the oddball of the particle family….OK, so where does gravity fit into all this? Just treat it like any other force – gravity is caused by massive particles throwing "gravitons," attractive particles, at each other….You may have caught wind of another theory of gravity called general relativity. A fellow named Einstein came up with it almost 100 years ago. Conceptually, it could not be any more different from the standard model. General relativity explains gravity by invoking the warping of space-time; the standard model explains it and everything else by invoking the exchange of subatomic particles. Problems happen when we try to put the two theories together…. Problems like mathematical inconsistencies, zeroes in denominators, nonsensical results…. Yet, as we have seen, gravity is much weaker than every other force…. According to brane theory, we lose gravitons out into the fourth dimension. The result: gravity is weak….Gravitons, like photons, do not possess the property known as mass. They weigh nothing…there is another, mirror brane located as little as a millimeter or so

> away from us at all times, but which we can never reach, because we are not gravitons…[1150]

Gravity has been the fly in the ointment of every theory concocted by modern science. A theory may be able to explain (at least within its own framework) about 75% of nature, but if it fails to explain the 25% due to gravity, then the whole theory is brought to naught. String Theory is the invention of a handful of scientists seeking for some solution to the intractable problem created when one attempts to combine General Relativity's explanation of gravity with Quantum Mechanics' explanation of the nuclear forces holding the atom together. General Relativity could explain things (at least mathematically) on the macroscale (*e.g.*, planets, stars), and Quantum Mechanics could do the same on the microscale (*e.g.*, atoms, quarks), but in instances when the macro met the micro, as is the case, for example, when a star of great mass is said to collapse into an infinitesimal point particle (*e.g.*, a "blackhole"), then both theories break down, producing nonsense, both physically and mathematically.

The refusal of Relativity to marry Quantum Mechanics also means that no children will be produced from that non-union. Science is stymied, and they will continue to be stymied. Not willing to admit that their mathematical inventions of General Relativity and Quantum Mechanics do not represent physical reality, and desperately seeking a solution other than constituting the universe with 95% make-believe matter (*i.e.*, Dark Matter), a group of these puzzled scientists invented another mathematical model hoping to combine the two disciplines into one unified formula, or what was dubbed as a "theory of everything."[1151] Three of the pioneers in this search were Leonard Susskind, Michael Green and John Schwarz. To get the ball rolling, Susskind borrowed a formula from mathematician Leonhard Euler (d. 1783) and applied it to the strong force between atoms. Then Green and Schwarz were successful in 1984 in working out a mathematical formula that at least balanced both sides of the equal sign. Their formula translated into a model of one-dimensional vibrating strings of energy that were said to compose the quarks and leptons of atoms. These vibrating strings were said to be moveable and pliable, as opposed to the rigidness of point particles. They also came in many sizes and shapes, which were defined by the amount of vibration each string possessed, which in turn determined their function.

[1150] Michael Moyer, "Journey to the 10th Dimension," *Popular Science*, March 2004.

[1151] See Brian Greene, *The Elegant Universe: Superstrings, Hidden Dimensions, and the Quest for the Ultimate Theory*, 1999; Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality*, 2004.

It was discovered in the late 1980s, however, that the mathematics of String Theory produced five different, yet valid, theories. Some theories were radically different from the others. Some had closed strings, others had open strings, and some even required at least 26 dimensions in order to function. The acknowledged "Einstein" of Quantum Mechanics, Edward Witten, supposedly found a solution, proposing that each was simply a different way of looking at the results. The new perspective was called "M-theory" (for reasons no one is quite sure). Still, the bad news was that these strings needed six extra dimensions (other than the three we have already) in order to do their specific jobs. In brief, the extra dimensions were the means to overcome the barriers of Relativity theory that limits anything from traveling faster than the speed of light. The multiple dimensions of String Theory allowed matter to take a "short cut," as it were, through dimensions that Relativity did not possess. To help justify the six dimensions, String Theory advocates borrowed from the theory of Theodore Kaluza and Oskar Klein who had proposed in the early 1920s that a fifth dimension existed that carried electromagnetic waves. Hermann Minkowski had already added time as a fourth dimension in order to make the mysterious entity "space-time."[1152] String theorists reasoned that if there can be four or five dimensions, why not ten or eleven? As we noted above, "branes" or membranes were invented to help solve this problem.

Still, the mathematics of String Theory eventually led the extra dimensions to the same absurd infinities that hampered General Relativity. Yet, for reasons that String theorists can only rationalize by appealing to the "anthropic principle" (*i.e.*, things are the way they are because we wouldn't be here if they were any other way), somehow we are magically left with only three spatial dimensions (length, height and width) that aren't absorbed into infinity. Alas, String Theory doesn't really explain anything. It is merely a mathematical model, and a desperate one at that, with no physical proof, and none in sight. It reaches a virtual dead end, and science is left without a solution to the problem of how to combine General Relativity with Quantum Mechanics.[1153]

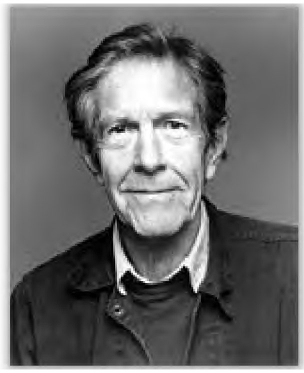
[1152] Charles Lane Poor divests Minkowski's "fourth dimension" of its mystique quite easily. He writes: "To most people, the very words, four dimensions, are enough; everything at once becomes incomprehensible and absurd. Yet there is no reason for this too prevalent idea: in the broad sense of the words, there is nothing new or startling in the four dimensional idea. It is a matter of common, every-day knowledge that, in order to describe fully an event, we must tell not only where the event took place, but when" (*Gravitation versus Relativity*, p. 37).

[1153] Imaginations certainly run wild in the "objective" world of modern science. Leonard Susskind has recently advocated that String Theory predicts as many as 10^{500} different universes, each with its own set of physical properties. Out of the

The real solution, of course, is that both Relativity and Quantum Mechanics are failed theories of reality in themselves, and this inadequacy shows up very clearly when schemes to combine the theories must be aborted. But since modern science has wedded itself to the Big Bang process, it will be forever trapped in theories that simply don't work. The only possible explanation is that the universe was created by divine fiat, *ex nihilo*, but it is precisely that solution which modern man is unwilling to accept. It is not "branes" that collide to make universes, it is God who creates, and the first thing with which He started was Earth, in the center of it all, as Genesis 1:2 clearly states. Until science realizes this simple fact, it will be dreaming up theories that produce dead ends. As physicist Michael Duff was wise enough to admit:

> Well, the question we often ask ourselves as we work through our equations is: 'Is this just fancy mathematics, or is it describing the real world?'….Oh yes, it's certainly a logical possibility that we've all been wasting our time for the last twenty years and that the theory is completely wrong.[1154]

Can Modern Man Live in the Universe He has Fashioned?



John M. Cage
1912 – 1992

As we often discover among famous scientists and philosophers who develop their unique theories, although their thoughts are logical according to their own premises, those same ruminations will not allow the inventor to live in the system he has created. The existentialist says everything is absurd, but he can't live in an absurd world. The nihilist says everything leads to anarchy, but he can't live in a world of anarchy. The atheist denies the existence of God, but foxholes have a way of persuading him otherwise. The evolutionist says everything is by chance, but he is very careful to avoid walking in front of moving

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10^{500} possible universes, Susskind admits he has no reason why our single universe, with its unique biological life, came into existence, but he insists, nevertheless, "that it cannot be due to Intelligent Design" (Leonard Susskind, *The Cosmic Landscape: String Theory and the Illusion of Intelligent Design*, 2005).

[1154] "A Conversation with Brian Greene," Nova television series, Public Broadcasting Service, October 2004.

traffic and choosing food that is non-poisonous.

John Cage, the famous composer of the mid-twentieth century, is a perfect example of the dichotomy in which modern man finds himself. Cage made a name for himself by performing concerts based on *musique concrète*. To impress upon his audience that we lived in a universe of chance where all is relative, Cage used mechanical musical conductors that operated by random action, leading the orchestra members to play their instruments haphazardly. The "music," of course, became a mere collection of noises with no meter or melody. At the end of the concert the orchestra would often hiss at Cage while he took his bow to the audience in order to register its discontent. Yet there was an obvious contradiction between Cage's philosophy and his practical life. In addition to being a famous conductor, John Cage was also a world famous mycologist (one who specializes in the study of mushrooms). He had one of the most extensive private libraries ever compiled on the subject. Since some mushrooms are poisonous, Cage had to be very careful which ones he consumed. As he said himself: "I became aware that if I approached mushrooms in the spirit of my chance operations, I would die shortly….So I decided that I would not approach them in this way!" [1155] Obviously, he could not live in the "chance" world he created for himself.

Erwin Schrödinger
(1887 – 1961)

Austrian physicist Erwin Schrödinger (d. 1961) one of the world's premier scientists and the inventor of Quantum Mechanics, found himself in the same dilemma. At one point he stated: "I do not like it [quantum mechanics], and I am sorry I ever had anything to do with it." In his 1945 book *What is Life* he admitted that discovering the true laws of nature may be beyond human understanding. Since physics had not, and to this day has still not, settled on whether the electron is a particle, a wave or some combination of the two; or how the electron can seem to be in two places at the same time (otherwise known as "superposition of states" or "entanglement"), Schrödinger wanted to demonstrate the unlivable absurdities to which his theories often led. He thus introduced the world to his famous feline, otherwise known as "Schrödinger's Cat." As one author puts it:

[1155] Calvin Thomas in *The New Yorker*, November 28, 1964, as cited in Francis Schaeffer's *The God Who is There*, Crossway Books, 1990, p. 79.

> A cat is in a box with a lid that is shut. Within the box is a radioactive atom that has a 50-50 chance of decaying in an hour. If the atom decays this triggers a mechanism that breaks a vial of poison gas which kills the cat. The cat has two states: alive or dead. Schrödinger argued that if we take seriously the idea of the superposition of states [of atomic particles] then we must write for the cat's state: cat > = a/alive > + b/dead >, that is, the cat apparently is in a superposed state of life and death! Then we open the box. According to the measurement hypothesis (discussed next) when we open the box, we are performing a measurement of the cat's state; this is said to cause the cat's superposed state to collapse into one base state or the other. The cat is found either pushing up the daisies, or purring for its milk. Schrödinger found this so totally absurd that (like Einstein) he could not bring himself to embrace fully the new mechanics he helped create.[1156]

As noted, the same kinds of dichotomies began to penetrate the soul of Albert Einstein. Here is how his biographer describes the series of events:

> They had solved individual problems, but they had done nothing to replace the all-embracing pattern of classical physics which they had first questioned, then shattered. Planck's quantum theory, Einstein's photons, Rutherford's first ground plan of the nuclear atom and Bohr's disturbing explanation of it – had each provided isolated answers to isolated problems. Yet in the

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[1156] www.physics.fsu.edu/users/ProsperH/AST3033/quan tumworld.htm. In 1957, Princeton University scientist, Hugh Everett, explained the "superposition of states" as evidence of a parallel universe, claiming that the cat is both dead and alive, that is, dead in one universe and alive in another. Before Schrödinger's box is opened, the parallel universes exist simultaneously, but when the box is opened this causes the universes to separate and the superposition is terminated. Still, one cannot predict whether he will find a dead cat or a living car before the box is opened. Two opposing philosophical/scientific interpretations flow from this unpredictability: (a) the Copenhagen interpretation led by Niels Bohr, which states that subatomic particles, by nature, *do not have* defined properties; and (b) Einstein's theory that subatomic particles, by nature, *do have* defined properties, but our instruments are woefully inadequate to determine them with any accuracy.

> process they seemed to have produced more riddles than they had solved. ‘By the spring of 1925,’ writes Martin Klein, ‘the theoretical picture had been elaborated by the work of many physicists into a tantalizingly incomplete and confused tangle of successes and failures, so that Wolfgang Pauli, one of the most acute, and most outspoken, of the young theorists could write to a friend: ‘Physics is very muddled again at the moment; it is much too hard for me anyway, and I wish I were a movie comedian or something like that and had never heard anything about physics.’[1157]

The Copenhagen Perspective

Einstein biographer Ronald Clark also traces the steps that led to the absurd conclusions of quantum mechanics, especially those of the Copenhagen variety.

> A fundamental premise of classical physics was that events followed each other in succession on a basis which could be predicted if only one understood the laws of nature and had sufficient facts….Certain factors in the quantum theory had first cast a ray of doubt upon this comfortable assumption: the electron in the Bohr atom, jumping from one orbit to another without obvious cause, tended to increase this doubt. Was there, perhaps, no real ‘cause’ for such movements?…Might not the whole conception of causality in the universe be merely an illusion? This possibility had already gravely disturbed Einstein…and as early as January, 1920, he had voiced his doubts to Max Born. “The question of causality worries me also a lot.”[1158]

After the contributions of Louis de Broglie and Erwin Schrödinger, things began to move rapidly:

> What had thus occurred within a very few years was a steady merging of the particle and wave concept. The electron…appeared that it was both at the same time. Here it

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[1157] *Einstein: The Life and Times*, pp. 405-406. His teacher once told Max Planck: “Physics is finished, young man. It’s a dead-end street,” then advised Planck to become a concert pianist (Nick Herbert, *Quantum Reality*, p. 31).

[1158] *Einstein: The Life and Times*, pp. 406-407.

> seemed that science had run up not only against ‘common sense,’ which was already suspect when it began to deal with events in the subatomic world, but against rational logic. For could anything really be one thing and its opposite at one and the same time?[1159]

Which then led to the inevitable climax:

> Schrödinger’s wave mechanics…was thus credible on the grounds that reality is what you make it. This was disturbing enough to those who believed that all ignorance in science could be removed by an addition of knowledge. But more was to follow…a totally different approach was being made by Werner Heisenberg….Thus by 1927 the de Broglie-Schrödinger picture of the electron was being matched by a purely mathematical explanation of the atom….The suggestion that a satisfactory picture of the physical world could consist not of a description of events but of their probabilities had already been made in Heisenberg’s famous ‘uncertainty principle.’[1160]

The significant outcome of these events was, as de Broglie put it many years later, quantum physics now appeared to be “…governed by statistical laws and not by any casual mechanisms, hidden or otherwise. The ‘wave’ of wave mechanics ceased to be a physical reality….The corpuscle, too, was turned into a mere phantom…”[1161] The Copenhagen interpretation of Quantum Mechanics, and virtually all of modern physics today, holds that matter does not exist until an observer looks at it, or that matter does not exist independently of the observer. It is the observer's previous knowledge of the matter that creates its physical reality. More technically, all of matter is understood as a "wave function," a surreal explanation of the universe that expresses itself only in mathematical equations. When the observer looks in any direction, his mere glance is said to "collapse the wave function," and thus he sees the material object before him. This "collapse" is the main reason that science can think of light both as a particle and a wave, simultaneously. In effect, the "wave" of light "collapses" when one observes it and thus one can then "see" the particle.

[1159] *Einstein: The Life and Times*, p. 410.

[1160] *Einstein: The Life and Times*, pp. 410-411. Schrödinger further complicated the picture since his energy-momentum relationship ($E = \rho^2/2m$) was thoroughly anti-Relativistic. Paul Dirac tried to bridge this gap with his alternative to $E = mc^2$, namely, $E^2 = m^2c^4$. Schrödinger writes: “Surely you realize the whole idea of quantum jumps is bound to end in nonsense…if the jump is sudden, Einstein’s idea of light quanta will admittedly lead us to the right wave number, but then we must ask ourselves how precisely the electron behaves during the jump. Why does it not emit a continuous spectrum, as electromagnetic theory demands? And what law governs its motion during the jump? In other words, the whole idea of quantum jumps is sheer fantasy.” Niels Bohr retorts: “What you say is absolutely correct. But it does not prove that there are no quantum jumps. It only proves that we cannot describe them, that the representational concepts with which we describe events in daily life and experiments in classical physics are inadequate when it comes to describing quantum jumps” (as recorded by Werner Heisenberg in *Physics and Beyond*, 1971, pp. 73-74).

[1161] *Einstein: The Life and Times*, p. 412.

If one tends to think these ideas are absurd, he is in good company. Richard Feynman, one of the premier physicists in the world during his day, admits: "The theory of quantum electrodynamics describes Nature as absurd from the point of view of common sense. And it agrees fully with experiments. So I hope you can accept Nature as she is – absurd."[1162] Or as Werner Heisenberg puts it: "The law of causality is no longer applied in quantum mechanics."[1163]

Rather than question whether their own theories about Nature are absurd (which implies that they know very little about Nature), proud scientists like Feynman and Heisenberg would rather put the blame on Nature. As long as they remain in this quagmire, the men of Feynman's generation will never be able to come to the truth. They will only disguise their ignorance in mathematical equations. As Heisenberg himself admitted: "The paradoxes of the dualism between wave picture and particle picture were not solved; they were hidden somehow in the mathematical scheme."[1164] In essence, the only difference between medieval superstition and modern physics is that the latter has the privilege of hiding its superstitions in complex equations that no one understands.

At this point Einstein had much trouble living in the universe that his Relativity theory helped create:

> While Born, Heisenberg, and Bohr accepted it without qualification, Einstein and Planck accepted it only with the strongest qualifications. Yet these two were the very men who a quarter of a century earlier had pulled into physics the very ideas which they now thought of as its Trojan horse.

[1162] Richard P. Feynman, *The Strange Theory of Light and Matter*, 1988, p. 10.

[1163] Werner Heisenberg, *Physics and Philosophy: The Revolution in Modern Science*, 1966, p. 88.

[1164] *Ibid.*, p. 40.

> The break with the old world which this new concept epitomizes can be illustrated by two statements. One is by Sir Basil Schonland, who describes the new world in *The Atomist.* 'It appeared experimentally proven,' he says, 'that at the bottom of all phenomena there were to be discerned laws of chance which made it impossible to think of an ordered deterministic world; the basic laws of nature appeared to be fundamentally statistical and indeterminate, governed by the purest chance.'[1165]

Werner Heisenberg received fame in the physics world for what has become known as the *Uncertainty Principle* – a further blow to the pride of science. As noted earlier, this is a principle, accepted reluctantly by the entire scientific world (because they have no other choice), which states that there is no accurate way to measure size, distance and location in the sub-atomic world. As science had long been debating whether light and matter were made up of particles or waves,[1166] Heisenberg sealed the door shut by saying that the mere act of trying to figure it out influences the result, and thus it will always be "uncertain."[1167] To use a crude analogy,

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[1165] *Einstein: The Life and Times*, pp. 412-413.

[1166] The perplexity of the issue was brought out no better than the summation voiced in 1927 by Sir William Bragg, director of the Royal Institution: "On Mondays, Wednesdays, and Fridays we teach the wave theory and on Tuesdays, Thursdays, and Saturdays the corpuscular theory" (*Einstein: The Life and Times*, p. 420). Forty years later, when one would assume that science had a better grasp on the quantum world, Richard Feynman, one of its more prominent spokesman, wrote: "I think I can safely say that nobody understands quantum mechanics" (1967 paper: "The Character of Physical Laws"). Niels Bohr once quipped: "But, but, but…if anybody says he can think about quantum theory without getting giddy it merely shows that he hasn't understood the first thing about it" (Otto Frisch, citing Bohr, in *Niels Bohr, A Centenary Volume*, editors, A. P. French and P. J. Kennedy, 1985, p. 136). Heisenberg adds: "Let us consider an atom moving in a closed box which is divided by a wall into two equal parts. The wall may have a very small hole so that the atom can go through. Then the atom can, according to classical logic, be either in the left half of the box or in the right half. There is no third possibility: *tertium non datur*. In quantum theory, however, we have to admit – if we use the word 'atom' and 'box' at all – that there are other possibilities which are in a strange way mixtures of the two former possibilities. This is necessary for explaining the results of our experiments" (Werner Heisenberg, *Physics and Philosophy*: *The Revolution in Modern Science*, 1966, pp. 181-182).

[1167] In seeking to determine the position and velocity of a subatomic particle, one must shine light on the particle, but light has a limited capability due to its wavelength (the length between the crests of its wave) and its size (one quantum). If one wants to measure the position of one particle in relation to another particle, he would employ light of a very short wavelength in order to penetrate between

Heisenberg revealed that our ability to penetrate the atom was as limited as trying to dissect an ant with a telephone pole. The only other option for science was to bombard the ant with other ants at very high speeds and wait to see what came out. In any case, Heisenberg demonstrated that man's technology is woefully inadequate to discover precisely what makes up our world. He reduced physical science to good guesses rather than precise facts, yet science camouflages its inadequacies by appeal to such things as "statistics" and "the wave/particle" theory, and "multiple histories of space-time." Where Einstein threw the macroscopic world upside down by saying that everything was in motion and therefore all measurements were "relative," so Heisenberg did the same with the microscopic world by saying that the atom was just as "relative" as the universe, and nobody was quite sure about anything anymore, big or small. We might say there was both an Atomic Uncertainty Principle and a Cosmological Uncertainty Principle hampering the advancement of science.

The Demise of Relativity Theory

Einstein publicly criticized Heisenberg's *Uncertainty Principle* and Quantum Mechanics. But Quantum Mechanics, by depending on nothing more than statistical analysis, was having reasonable success in analyzing and predicting the effects of the subatomic world, and thus Einstein's opposition was more or less a losing battle. Einstein spent the rest of his career trying to meld General Relativity and Quantum Mechanics, without any success (and no success has come to anyone else). In fact, his post-Relativity career was virtually fruitless. This failure suggests (and Einstein

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the particles. But in choosing a short wavelength, one quantum of that wavelength will disturb the particle and change its velocity to a proportionate degree. Thus, the more accurately one tries to measure the position of the particle the more the particle's velocity will be altered from its original movement. According to Heisenberg's equation ($\Delta p \Delta x \geq$ « where Δp is the difference in, or uncertainty about, momentum; while Δx is the difference in, or uncertainty about, location. Thus, the product of the uncertainty in the position of a particle and the uncertainty in the momentum of the particle is greater than or equal to Planck's constant) if in determining the position of a particle one can cut the margin of error in half, he will inevitably double the uncertainty of the particle's velocity, and vice-versa. To get an idea of the magnitude of the "uncertainty" left to us by Heisenberg, if a car were traveling 64.9999999999999999999999999999 mph, and another car traveling beside it was moving precisely at 65 mph, if the two vehicles represented electrons whose positions were known but whose speed needed to be measured, the difference in speed between the two would be on the order of 100,000. In the atomic world, that is quite an "uncertainty."

was quite cognizant of it) that one or both of the theories were wrong. Hence, we can understand why he worked so feverishly to unify the two theories since, if he could show that the two worked together, he would save his own theory from being obliterated.

For Einstein, one of the chief threats of Quantum Mechanics was that it would eventually nullify one of his most famous conceptions, "space-time," thereby completely overthrowing Relativity. As *Scientific American* describes it:

> After all, relativity is riddled with holes – black holes. It predicts that stars can collapse to infinitesimal points but fails to explain what happens then. Clearly the theory is incomplete…. Moreover, quantum theory turns the clock back to a pre-Einsteinian conception of space and time. It says, for example, that an eight-liter bucket can hold eight times as much as a one-liter bucket. That is true in everyday life, but relativity cautions that the eight-liter bucket can ultimately hold only four times as much – that is, the true capacity of buckets goes up in proportion to their surface area rather than their volume. This restriction is known as the holographic limit. When the contents of the buckets are dense enough, exceeding the limit triggers a collapse to a black hole. Black holes may thus signal the breakdown not only of relativity but also of quantum theory (not to mention buckets).[1168]

With revelations like the above, most physicists are quietly burying Einstein's theories in private ceremonies, but the public is not yet invited since it would burst – just a little too soon – the 100-year-old aura the scientific community created around him. Even his admirers are quite candid about the demise of Einstein's theories. Brian Greene writes:

> Bell's reasoning and Aspect's experiments show that the kind of universe Einstein envisioned may exist in the mind, but not in reality. Einstein's was a universe in which what you do right here has immediate relevance only for things that are also right here. Physics, in his view, was purely local. But we now see that the data rule out this kind of thinking; the data rule out this kind of universe.[1169]

[1168] George Musser, "Was Einstein Right," *Scientific American*, Sept. 2004, p. 89.

[1169] Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality*, 2004, pp. 120-121.

What the public knows of Einstein’s inner turmoil, however, is merely his famous quote: “God does not play dice with the world,” heard in every quarter of the civilized world. As Clark writes:

> His feelings went deep, and were epitomized in the famous phrase…which he used in a letter to Max Born on December 12, 1926. ‘Quantum mechanics is certainly imposing. But an inner voice tells me that it is not yet the real thing. The theory says a lot, but does not really bring us any closer to the secret of the Old One. I, at any rate, am convinced that He does not throw dice….As Einstein put it years later to James Franck: “I can, if the worst comes to the worst, still realize that the Good Lord may have created a world in which there are no natural laws. In short a chaos. But that there should be statistical laws with definite solutions, *i.e.*, laws which compel the Good Lord to throw dice in each individual case, I find highly disagreeable.”‘[1170]

Here again we see that Einstein cannot live in the world to which his theories inevitably lead. He now appeals to “the Old One,” and more specifically “the Good Lord,” as the preferred reference frame, as it were, for his critique of modern physics. Something deep inside forced him to become quasi-religious as the world he helped create got a little too crazy for even his sensibilities. In any case, Heisenberg, for one, was not moved by Einstein’s appeals to “the Good Lord.” He knew that Einstein was the very one who had opened Pandora’s box. In one particular conversation, Heisenberg let him know just how hypocritical Einstein’s position was:

[1170] *Einstein: The Life and Times*, p. 414. At the **Fifth Solvay Congress in 1927**, Niels Bohr further comments: “On his side, Einstein mockingly asked us whether we could really believe that the providential authorities took recourse to dice playing […ob der liebe Gott würfelt]…I remember, also, how at the peak of the discussion Ehrenfest, in his affectionate manner of teasing his friends, jokingly hinted at the apparent similarity between Einstein’s attitude and that of the opponents of relativity theory…” (*ibid*., p. 418). At the same congress, Ehrenfest had another opportunity to put all the confusion into perspective. As Clark reports: “…Lorentz did his best to give the floor to only one speaker at a time. But everyone felt strongly. Everyone wanted to put his own view. There was the nearest thing to an uproar that could occur in such distinguished company, and in the near confusion Ehrenfest moved up to the blackboard which successive speakers had used and wrote on it: ‘The Lord did there confound the language of all the Earth” (*ibid*., p. 417).

The Fifth Solvay Conference, 1927

From back to front and from left to right: Auguste Piccard, Émile Henriot, **Paul Ehrenfest**, Édouard Herzen, Théophile de Donder, **Erwin Schrödinger**, Jules-Émile Verschaffelt, **Wolfgang Pauli**, **Werner Heisenberg**, Ralph Howard Fowler, **Léon Brillouin**, Peter Debye, Martin Knudsen, William Lawrence Bragg, Hendrik Anthony Kramers, **Paul Dirac**, **Arthur Compton**, **Louis de Broglie**, **Max Born**, **Niels Bohr**, Irving Langmuir, **Max Planck**, Marie Skłodowska Curie, **Hendrik Lorentz**, **Albert Einstein**, **Paul Langevin**, Charles Eugène Guye, Charles Thomson Rees Wilson, Owen Willans Richardson

> **Heisenberg**: "We cannot observe electron orbits inside the atom.…Since a good theory must be based on observable magnitudes, I thought it more fitting to restrict myself to these, treating them, as it were, as representatives of the electron orbits."
>
> **Einstein**: "But you don't seriously believe that none but observable magnitudes must go into physical theory?"
>
> **Heisenberg**: "Isn't that precisely what you have done with relativity?"
>
> **Einstein**: "Possibly I did use this kind of reasoning, but it is nonsense all the same.…In reality the very opposite happens. It is the theory which decides what we can observe." [1171]

[1171] *Physics and Beyond*, translated by Arnold J. Pemerans, 1971, p. 63. Original in German is titled *Der Teil und das Ganze*, München: Piper, 1969, S. 79-80. Einstein's quote ("It is the theory which decides what we can observe") seems to be well known, since it was quoted in *Discover's* April 2004 issue, page 14, although without a reference. Heisenberg also writes of Einstein: "Bohr and Einstein were in the thick of it all. Einstein was quite unwilling to accept the

With that interesting peek into the methodology of Einstein, the saga continues:

> The distressing position in which Einstein now found himself was not unique. J. Robert Oppenheimer has pointed out how 'many of the men who have contributed to the great changes in science have really been very unhappy over what they have been forced to do, and cites not only Planck and Einstein but Kepler and de Broglie. The process is not restricted to physics. Lord Conway…has pointed out that "each generation makes of the world more or less the kind of place they dream it should be, and each when its day is done is often in a mood to regret the work of its own hands and to praise the conditions that obtained when it was young."'[1172]
>
> So with Einstein. At times he was wryly humorous about his inability to accept the new world which his colleagues had created. Philipp Frank visited him in Berlin, apparently in 1932, and they began to talk of the new physics. Then, says Frank, 'Einstein said, partly as a joke, something like this: "A new fashion has now arisen in physics. By means of ingeniously formulated theoretical experiments it is proved that certain physical magnitudes cannot be measured, or, to put it more precisely, that according to accepted natural laws the investigated bodies behave in such a way as to baffle all attempts at measurement. From this the conclusion is drawn that it is completely meaningless to retain these magnitudes in the language of physics. To speak about them is pure metaphysics."'[1173]

And then Einstein was hit with the proverbial mirror to see his own reflection:

> And when Frank pointed out to Einstein that he had invented the fashion in 1905, Einstein answered: 'A good joke should not be repeated too often.' More cogently, he explained to Infeld – the Pole who had visited him in Berlin and who was later to join him in the United States – 'Yes, I may have started it, but I regarded

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fundamentally statistical character of the new quantum theory" (Werner Heisenberg, *Physics and Beyond*, 1971, p. 79).

[1172] *Ibid.*, pp. 413-414.

[1173] *Ibid.* , p. 414.

> these ideas as temporary, I never thought that others would take them so much more seriously than I did.'[1174]

Einstein's facile attempt at deflecting the blame away from himself is certainly disturbing. Perhaps he is trying to pass off his theory of Relativity as just an exercise in free-thinking, as is the case with his famous "thought experiments." Or perhaps, when his theories are found to lead to absurdities, he would have us pull the plug and call it all a joke. What kind of man would pardon himself by suggesting that men subsequent to him shouldn't have taken the implications of his theories so seriously?

The Indian astrophysicist, **Subrahmanyan Chandrasekhar** was said to have a "deep anger" at Einstein for not sufficiently developing his theories and consequently leaving the struggle to others.[1175] Perhaps in line with his above comment to Heisenberg ("It is the theory which decides what we can observe"), Einstein's following comment makes more sense: "When I examine myself and my methods of thought I come to the conclusion that the gift of fantasy has meant more to me than my talent for absorbing positive knowledge."[1176] Unfortunately, it is precisely these "fantasies" that have turned the world upside down. To those who are looking to get out from the quagmire into which Einstein and modern physics have put the world, his words are indeed no "joke," especially for those of us who realize that Einstein's *Trojan Horse* was created in 1905 precisely to escape the clear and numerous experimental results showing that ether existed and that the Earth was standing still in it. Almost all the absurdities of modern physics have their root in the "fantastic" interpretations Einstein gave to those crucial experiments.

Thus, we see that Einstein, like many before him whose perspective was limited, was forced to question the validity of their own theories. This was inevitable, for Relativity makes all understanding just that – relative – with no certainty and no absolutes. Einstein could not live with his own theory, and, as we have documented, at many points he found himself retracing his steps and reviving the very concepts that he had originally denied.

[1174] *Ibid.*, p. 414.

[1175] Interview of Dr. Chandrasekhar by Lee Smolin, cited in *Discover*, September 2004, p. 39.

[1176] *Einstein: Life and Times*, p. 87 in 1971 edition.

Newton's Absolute Space and the Spinning Water Bucket

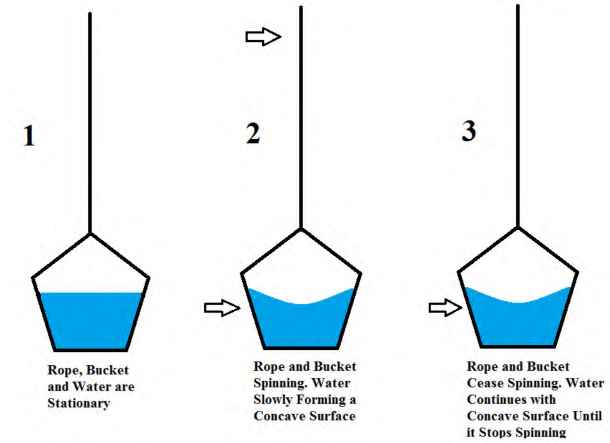
As we noted earlier, Einstein felt compelled to come closer to Newton's idea of "absolute space," and thus he returned to the concept of ether. Einstein's appeal to Newton stems from the problem Newton discovered concerning the "**spinning bucket of water**." Although Newton did not make any definitive claims as to the constitution of space, nevertheless, as opposed to Einstein, he believed it was absolute, that is, space had an existence separate from the matter contained within it and independent of the arbitrary perceptions of Einstein's "observer." As he states it: "Absolute space, in its own nature, without regard to anything external, remains always similar and immovable."[1177] Space never changed, no matter what event occurred in it or who observed that event. We know this postulate in modern terms as "the inertial frame of reference."

Newton was led to his particular understanding, and attempted to prove it, by the experiment of the spinning bucket of water. Here is how the 1689 experiment was conducted: Newton hung a bucket of water by a rope. He turned the bucket so the rope was wound up very tightly, and then he allowed the rope to unwind. As the bucket spun, the water level, which was previously flat, gradually started to curve up the sides of the bucket. In all such experiments, as the water begins to rotate the surface of the water becomes concave. Here Newton had a keen insight. When the bucket started to move against the water, the water level was flat. It was only when water was rotating that the surface of the water began to curve upwards. As Newton puts it:

> …the surface of the water will at first be plain [flat], as before the vessel began to move; but the vessel, by gradually communicating its motion to the water, will make it begin sensibly to revolve, and recede little by little from the center, and ascend up the sides of the vessel, forming itself into a concave figure (as I have experienced), and the swifter the motion becomes, the higher will the water rise, till at last, performing its revolutions in the same time with the vessel, it becomes relatively at rest in it.[1178]

[1177] Isaac Newton, *Philosophiae Naturalis Principia Mathematica*, Bk. 1 (1689); translated by Andrew Motte (1729), revised by Florian Cajori, Berkeley: University of California Press, 1934, Definition VIII.

[1178] *Ibid.*, Definition XII.


1
2
3
Rope, Bucket and Water are Stationary
Rope and Bucket Spinning. Water Slowly Forming a Concave Surface
Rope and Bucket Cease Spinning. Water Continues with Concave Surface Until it Stops Spinning

Newton correctly reasoned that it was not the bucket that changed the shape of the water's surface, that is, it was not the inside of the bucket that was attracting the water. Once the surface of the water curved upward, the bucket's only function was to contain the water in a confined space. If one suddenly stops the spinning bucket, the surface of the water will remain concave as long as the water's velocity continues. Or, one can replace the water and the bucket with a disc of putty and observe how the putty expands radially as it is rotated. Newton reasoned that it was something about the nature of rotation itself that causes this phenomenon.

Although this experiment seems simple and ordinary, it has spawned some of the most perplexing scientific and philosophical questions man has ever faced. Using a little personification to help understand the perplexity of this phenomenon, we would ask: how does the water know that it is rotating and that it should form a concave surface? If the sides of the bucket are not creating the phenomenon except to confine the water to one place, then against what is the water spinning and curving? Of course, being in the wake of Copernicus, Newton considered it unimaginable that a rotating universe against a fixed Earth or even the stars within it could be responsible for causing the water to curve upward, and thus he concluded that the water must be reacting to a fixed space surrounding it, and in that sense the water's motion was not relative but absolute. But in Newton's view, absolute space is more of a concept than a real entity with physical locus points. As such, the water's curve upward could not be caused by rotation in relation to absolute space. Hence Newton admitted he did not know why a rotating object should react in this way with absolute space. Instead, the label "centrifugal force" was employed to describe the phenomenon, but neither Newton nor anyone else could explain its origin because there existed no physical body that produced the force.

Newton tried a variation of the experiment, but this time it was a thought experiment. He envisioned two balls tied together with a rope. On Earth, if the balls are rotated around a common center, the rope will become taut as the balls recede from one another. But what would happen if the balls were rotated in an empty universe? As Newton puts it:

> For instance, if two globes, kept at a given distance one from the other by means of a cord that connects them, were revolved about their common center of gravity, we might, from the tension of the cord, discover the endeavour of the globes to recede from the axis of their motion, and from thence we might compute the quantity of their circular motions…. And thus we might find both the quantity and the determination of this circular motion, even in an immense vacuum, where there was nothing external or sensible with which the globes could be compared. But now, if in that space some remote bodies were placed that kept always a given position one to another, as the fixed stars do in our regions, we could not indeed determine from the relative translation of the globes among those bodies, whether the motion did belong to the globes or to the bodies…[1179]

Newton, of course, would have the same problem concerning the bulge of the Earth at the equator, since the same "centrifugal" force he invented for the water bucket and globes would necessarily be responsible for equatorial expansion. He writes:

> The equal gravitation of the parts on all sides would give a spherical figure to the planets, if it was not for their diurnal revolution in a circle. By that circular motion…by its ascent towards the equator it will enlarge the diameters there, and by its descent towards the poles it will shorten the axis….and therefore the diameter of the earth at the equator is to its diameter from pole to pole as 230 to 229.[1180]

Although Newton's ratio of 230:229 is very close to correct, he says he will provide us the reason for these "centrifugal" phenomena (he writes: "it shall be explained more at large in the following tract"), except for his reasoning that rotational motion created a force when it moved against absolute space, he did not provide a physical answer to the phenomena, but merely mathematical equations that calculated the amount of the forces involved. Thus, as he had earlier admitted:

[1179] *Ibid.*, Definition XIV.

[1180] *Ibid.*, Definition XVIII, Theorem XVI and Definition XIX, Problem III.

> It is indeed a matter of great difficulty to discover, and effectually to distinguish, the true motions of particular bodies from the apparent; because the parts of that immovable space, in which those motions are performed, do by no means come under the observation of our senses.[1181]

The problems were not over. Although unbeknownst to Newton, about two hundred years later Jean Foucault would demonstrate his famous pendulum. It would rotate like clockwork totally independent of the Earth beneath it. What was the force that rotated the pendulum? It could not be attributed to "centrifugal" force because the pendulum was rotating, not expanding outwards. Hence, another cause had to be invented to account for this apparently strange phenomenon. It was dubbed the "Coriolis" force, after the man, Gaspard-Gustave Coriolis, who discovered its effect. But this force, too, was invented, and thus had to be added in by hand to Newton's force equations, since there existed no physical body to account for its origin.

Foucault didn't know the origin either. As Assis notes:

> It is curious to note Foucault's description of his experiment. Sometimes he speaks of the rotation of the earth relative to space and other times relative to the fixed stars (heavenly sphere). He does not distinguish these two rotations or these two concepts….For instance, he begins by stating that his experiment showing the rotation of the plane of oscillation "gives a sensible proof of the diurnal motion of the terrestrial globe." To justify this interpretation of the experimental result he imagines a pendulum placed exactly at the North pole oscillating to and fro in a fixed plane, while the earth rotates below the pendulum. He then says: "Thus a movement of oscillation is excited in an arc of a circle whose plane is clearly determined, to which the inertia of the mass gives an invariable position in space. If then these oscillations continue for a certain time, the motion of the earth, which does not cease turning from west to east, will become sensible by contrast with the immobility of the plane of oscillation, whose trace upon the ground will appear to have a

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[1181] Ibid., Definition XIV.

> motion conformable to the apparent motion of the heavenly spheres…[1182]

As we will see when we cover the subsequent history, these slips of the pen, as it were, from Newton onwards betrays the common thread running through all the attempts to explain the water bucket and other such phenomena in regards to the difference between absolute and relative motion – the unproven presumption they inherited from Copernicus, the man who took away the one absolute they possessed – an immobile Earth. In time this ambiguous system became deeply problematic. At first the new theoreticians were somewhat inebriated by the sense of freedom Copernicus brought to them, for in their view he had unshackled the world from the grip of medieval philosophy and theology. Like the teenager who has his taste of freedom running away from home but soon discovers how lost and desperate he is as he tries to figure out life on his own, so the sons of the Enlightenment found themselves in the same predicament when they tore themselves away from the arms of their holy mother. There was simply no place to put an anchor any longer. Copernicus had cut the umbilical cord and men were now floating in space. From then onward, science and philosophy become little more than one attempt after another to restore Earth's moorings, but they tried to do so without giving up the Copernican theory – a formidable task, indeed.

The "Space" of Diggs, Bruno and Descartes

Thomas Digges (d. 1595) made it even more difficult. Two decades after Copernicus, Digges observed a "new star" in the cosmos and wrote about it in his work *Alae seu scalae mathematicae*. This "star" was the same supernova that Tycho Brahe had discovered in 1572. From this discovery, Digges proposed a modified Copernican universe, suggesting that the expanse of space was not closed but infinite, and that the sun and planets were located in a remote and isolated part of the cosmos. Although his father, Leonard Digges, held to the Ptolemaic model, Thomas Digges was a staunch leader of the Copernicans in England. In 1576 he added an appendix to his father's 1556 almanac, *A Prognostication Everlasting*, which supported the Copernican theory under the title: *A Perfit Description of the Caelestiall Orbes according to the most aunciente doctrine of the Pythagoreans, latelye revived by Copernicus and by Geometricall Demonstrations approved*. This was the first English publication supporting the Copernican theory, comprised mainly of an English translation of the main chapters of Copernicus' book, *De revolutionibus*.

[1182] L. Foucault, "Physical demonstration of the rotation of the earth by means of the pendulum," *Journal of the Franklin Institute*, 21:350-353, 1851, as cited in *Relational Mechanics* by Andre K.T. Assis, 1999, p. 78-79. Assis shows the fallacy in Foucault's thinking: "Experimentally it is found that this ω_d [angular rotation of the earth] has the same value (in direction and order of magnitude) as the kinematical rotation of the earth relative to the fixed stars…But there is no explanation of this fact in Newtonian mechanics….According to the Newtonian mechanics, these dynamical effects (deformation of the spherical form of the earth or rotation of the plane of oscillation of the pendulum can only be explained by a rotation of the earth relative to absolute space or to an inertial frame of reference" (*ibid.*, pp. 79, 81).

Right on the heels of Digges was **Giordano Bruno** (d. 1600). Most scholars have come to agree that it was Bruno as the person whom the Inquisition is alleged to have executed both for his heretical ideas and his insistence that the Church should not dictate truth.[1183] It is Bruno

> who must be regarded as the principal representative of the doctrine of the decentralized, infinite and infinitely populous universe; for he not only preached it throughout western Europe with the fervor of an evangelist, but also first gave a thorough statement of the grounds on which it was to gain acceptance from the general public.[1184]

Bruno defended Copernican cosmology in the 1584 book *La Cena de la Ceneri*,[1185] and developed his concept of an infinite universe in *De l'infinito e mondi* ("On the Infinite Universe and Worlds") and *De immenso et innumerabilis* ("On the Immense and the Innumerable").[1186] Whereas Copernicus' universe was much bigger than Ptolemy's and Aristotle's, it was finite, since it was enclosed within the sphere of fixed stars. Yet Copernicus' model would inevitably lead to an infinite universe, mainly because it had no center, but also because, as Koestler says, "once the apparent daily round of the firmament was explained by the Earth's rotation, the stars could recede to any distance,"[1187] and the more difficult it would be for the geocentrists to explain how an immense universe could rotate. With this implication, Bruno declared that Earth was merely a planet, and, sounding a bit like a modern String theorist or a forerunner of the "omega-searching" Teilhard de Chardin influenced by the "noosphere," Bruno held that:

[1183] See Chapter 14 of Volume II of this book for more information on Bruno.

[1184] A. O. Lovejoy's, *The Great Chain of Being*, p. 116, cited in Koyré, *From the Closed World to the Infinite Universe*, p. 39. Koyré concludes: "Bruno's world-view is vitalistic, magical; his planets are animated beings that move freely through space of their own accord like those of Plato or or Pattrizzi. Bruno's is not a modern mind by any means" (*ibid*., p. 54).

[1185] *La Cena de le Ceneri* in *Opere Italiano*, ed., Gentile, Bari 1907.

[1186] *De Immense et Innumerablilis*, in *Opera Latina Conscripta*, ed., Fiorentino, Naples, 1884, Libero III, cap. 9, vol. 1, pt. 1. 380-386, cited in Stimson, p. 51.

> …this world itself was merely one of an infinite number of particular worlds similar to this, and that all the planets and other stars are infinite worlds without number composing an infinite universe, so that there is a double infinitude, that of the greatness of the universe, and that of the multitude of worlds.[1188]

And by logical extension:

> To a body of infinite size there can be ascribed neither center nor boundary….there are in this space countless bodies such as our earth and other earths, our sun and other suns, which all revolve within this infinite space, through finite and determined spaces or around their own centers. Thus we on the earth say that the earth is in the center….Just as we say that we are at the center of that [universally] equidistant circle…so doubtless the inhabitants of the moon believe themselves at the center [of a great horizon] that embraces the earth….Thus the earth no more than any other world is at the center….From various points of view these may all be regarded either as centers, or as points on the circumference…Thus the earth is not in the center of the Universe; it is central only to our surrounding space.[1189]

These ideas were part of Bruno's "astro-theology," which greatly alarmed Church officials, who eventually had him extradited to Rome to face this and other incidents of heretical teaching.

[1187] *The Sleepwalkers*, p. 220.

[1188] William Roscoe Thayer, *Throne Makers*, New York, 1899, p. 268, *Giordano Bruno: His Trial, Opinions and Death*, pp. 252-308, cited in Stimson, p. 51.

[1189] *De l'infinito e mondi* p. 309, cited in Koyré, *From the Closed World to the Infinite Universe*, pp. 41-42.

Since science was isolating Earth in the faraway corners of space, **René Descartes** (d. 1650) attempted to at least apply a leash to the remaining cosmos by introducing his famous saying *Cogito ergo sum* ("I think therefore I am"). Once one forsakes his home, he will need a new start in life, an identity of his own, and what better identity could there be than the human cognition that caused the separation? Having picked himself up by his own bootstraps, he also needed a new home, an anchor to secure himself. This Descartes provided by inventing the "Cartesian coordinates." Instead of a sphere the universe was now partitioned into *x*, *y*, *z* coordinates, just as if one were to measure the length, width and height of a room from one of its corners. If one wants to locate a certain position within the room, he simply finds the place where the three coordinates intersect. The problem with this approach was, of course, that without an immobile Earth, Descartes was at a loss to tell us where the universe's "corner" is located. Thus Descartes came to believe that empty space did not exist but is made up of bodies themselves and their extensions. What we see as empty space is actually filled with bodies, small or large, and there is no place in the universe where a body does not exist. As such, when one measures "space" he is measuring the bodies which are compacted together, and out of which the Cartesian coordinates possess their intrinsic dimensions.[1190]

The Space of Leibniz, Euler & Kant

Gottfried Leibniz (d. 1716) came after Descartes and told a different story. His idea was that the space between the bodies sufficed for a definition of space. But since he also did not possess a central and immobile Earth, Leibniz was forced to say that no location of any object in space is in distinction to any other location. As such, there is no reason to speak of objects being located in certain places, and thus he also rejected Newton's concept of absolute space, since

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[1190] René Descartes, *Die Prinzipien der Philosophie*, ed. A. Buchenau, Philosophische Bibliothek, Vol. 28 (F. Meiner, Hamburg, Germany, 1992).

"absolute" implies that two or more locations can be distinguished. Newton's water bucket experiment did, however, present a problem to Leibniz. In his correspondence with Samuel Clarke, Leibniz admitted he had no answer to it:

> I find nothing in the Eighth Definition of the *Mathematical Principles of Nature*, nor in the Scholium belonging to it, that proved, or can prove, the reality of space in itself. However, I grant there is a difference between an absolute true motion of a body, and a mere relative change of its situation with respect to another body. For when the immediate cause of the change is in the body, that body is truly in motion; and then the situation of other bodies, with respect to it, will be changed consequently, though the cause of the change be not in them. 'Tis true that, exactly speaking, there is not any one body, that is perfectly and entirely at rest; but we frame an abstract notion of rest, by considering the thing mathematically. Thus have I left nothing unanswered, of what has been alleged for the absolute reality of space. And I have demonstrated the falsehood of that reality, by a fundamental principle, one of the most certain both in reason and experience; against which, no exception or instance can be alleged. Upon the whole, one may judge from what has been said that I ought not to admit a moveable universe; nor any place out of the material universe.[1191]

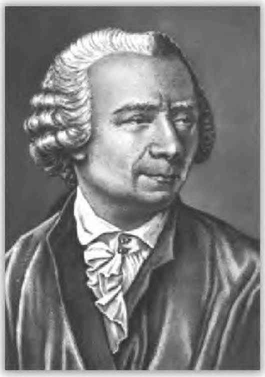
Here we note Leibniz's comment: "'Tis true that, exactly speaking, there is not any one body, that is perfectly and entirely at rest; but we frame an abstract notion of rest, by considering the thing mathematically." This, in precise terms, is the great problem that Copernicus left the world after his insistence that the Earth was moving in space.

Newton, as we have noted, used the water bucket experiment to attempt to prove the existence of absolute space, but he could neither explain the specific property space possessed that would allow it to pull up water, nor did he demonstrate how absolute space could be directly observed. Newton may have hinted at an answer by referring to "as the fixed stars do in our region."[1192] The precise contribution the stars made to the matter, however, would not be suggested until about two hundred years later in the work of Ernst Mach, and then immediately thereafter by Albert Einstein. Prior to that, George Berkeley had suggested that the water in the bucket was rotating not with respect to absolute space but to the stars, but at that time no one was apt to listen to challenges to Newton's view of the universe.

[1191] Leibniz-Clarke Correspondence, 5th paper, Manchester University Press, England, 1956.

[1192] Isaac Newton, *Philosophiae Naturalis Principia Mathematica*, Bk. 1 (1689); translated by Andrew Motte (1729), revised by Florian Cajori, Berkeley: University of California Press, 1934, Definition XIV.

Next on the scene was **Leonhard Euler** (d. 1783). He insisted that absolute space and absolute time are beyond much doubt, since these two components are compatible with observation, and therefore they are real, not imaginary. To Euler it made sense that merely imagining absolutes cannot serve as the basis for celestial mechanics, or for that matter, any mechanics. As such, Euler neither accepted Berkeley's suggestion that the stars are the absolute frame of reference nor the source that controlled the laws of inertia, since such star-power was considered "metaphysical," not mechanical.[1193]



Immanuel Kant (d. 1804) succeeded Euler. Using a bit of metaphysics, he concluded that space and time are *a-priori* elements of existence since, if we measure things in space and time, without them we would have no experience. Space and time thus become pristine forms of human intuition and, therefore, cannot be altered by experience. But this particular version of space and time is absolute, and must be distinguished from empirical space and time, the latter of which is a matter of perception, yet constitutes all the objects we experience. This formulation, of course, goes hand-in-hand with Kant's philosophical separation of the noumenal world (*i.e.*, "the thing in itself") from the phenomenal world (*i.e.*, the world known through experience), a philosophy that marked the beginning of the end for the Enlightenment, for man could no longer be certain that the things he experienced were real since they could just as well be a figment of his imagination.

Kant admitted, however, that circular motion, as opposed to uniform linear motion, is real motion in itself, since it presupposes the existence of an external force that prohibits the body from moving in a straight line. (This coincides with Newton's First Law of motion concerning inertia, which, as opposed to Aristotle's view, did not require a force to keep the body moving in a linear direction). From this reasoning, Kant makes his defense of Copernicanism. For him, it is not merely an "experiential" matter that the Earth rotates among fixed stars as opposed to the stars revolving around a fixed Earth, since according to Kant real motion can be demonstrated empirically by the presence of inertial forces.[1194] Kant, of course, was never exposed to the ideas of Ernst Mach, otherwise he would have known that inertial forces in space are just as relative as everything, assuming, of course, that there is no fixed Earth to decide the issue.

[1193] Leonhard Euler, "Réflexions sur l'espace et le temps," *Memoir de l'academie des sciences de Berlin* 4, 324, 1748.

It is significant that Kant concludes his analysis of the problem of motion by asserting that the Copernican theory was correct. It shows that upholding Copernicanism was at the forefront of the debate, although it was somewhat camouflaged by all the discussion concerning "absolute" versus "relative." The truth is that the sons of the Enlightenment were in quite a predicament trying to make sense of a universe in which everything was moving, thus causing the relations between objects to become very confusing. They were caught, on the one hand, trying to avoid the "unthinkable" (the immobile Earth the ancients had bequeathed to them) and, on the other hand, trying to salvage from this confusion their own "absolutes." Rejecting the Earth as the absolute, Descartes postulated his "Cartesian coordinates," Leibniz his "defined" space, Berkeley his "stars," Euler his "absolute space and time," Newton his "absolute space," and Kant his "circular motion," in order to fill the gapping hole left by Copernicus. None of these worked, however, and, in fact, the whole affair eventually produced the philosophical and mechanical schizophrenia latent in Kantianism.[1195]

Immanuel Kant
1724 -- 1804

[1194] Immanuel Kant, "Metaphysische Anfangsgründe der Naturwissenschaft," *Schriften zur Naturphilosophie*, Werkausgabe Band IX, ed., W. Weischedel, Suhrkamp, Frankfurt, 1968.

[1195] Interestingly enough, Kant didn't think too highly of Newton's view of the universe. He writes: "Newton's dynamics goes essentially beyond all observations. It is universal, exact and abstract; it arose historically out of myths; and we can show by purely logical means that it is not derivable from observation-statements" (cited in Karl Popper's, *Conjectures and Refutations*, p. 190). Popper adds: "Kant also showed that what holds for Newtonian theory must hold for everyday experience…that everyday experience, too, goes far beyond all observation. Everyday experience too must interpret observation; for without theoretical interpretation, observation remains blind – uninformative. Everyday

After Kant's wrecking ball, the world has never been quite the same. Men wandered around as philosophical zombies not knowing what was real and what was fantasy. It was just a matter of time before the relativistic world of Albert Einstein would serve as the nuclear bomb, as it were, to obliterate any attempt to revive an immobile Earth. But as the saying goes: 'what goes around, comes around,' for, inadvertently, it was the very theory of Relativity that breathed life back into the corpse of geocentrism since, by the very tenets of Relativity, Einstein proved there was no way to discount geocentrism. In other words, the very wall that they all sought to avoid was precisely the one into which they all ran!

Ernst Mach, Albert Einstein and Modern Philosophy

Before we analyze Mach's and Einstein's solutions to Newton's bucket problem, it would be beneficial to investigate their relationship. Of all scientists, **Ernst Mach** probably had the greatest influence on Einstein. Even though they would eventually diverge on several key points, according to Holton, "until Mach's death, and for several years after, Einstein declared himself a disciple of Mach." Mach was an Austrian physicist, physiologist and psychologist, who tried to understand reality through a synthesis of these disciplines. Moritz Schlick was one of his closest adherents and describes Mach's methodology in these words:

> Since all our testimony concerning the so-called external world relies only on sensations, Mach held that we can and must take these sensations and complexes of sensations to be the sole contents [Gegenstände] of those testimonies, and, therefore, that there is no need to assume in addition an unknown reality hidden behind the sensations…there exists in this world nothing whatever other than sensations and their connections… scientific knowledge of the world consists, according to Mach, in nothing

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experience constantly operates with abstract ideas, such as that of cause and effect, and so it cannot be derived from observations" (*ibid.*).

> else than the simplest possible description of the connection between the elements [sensations]…[1196]

One who is familiar with philosophy will see definitive elements of both Kant and Hume in Mach's approach. Kant more or less limited our understanding of reality to the categories of the mind obtained by *a priori* intuition, as opposed to the objectiveness of the thing in itself; and Hume believed that nothing could be known except by sense experience.

Michele Besso, Einstein's oldest and closest friend, had introduced him to the work of Mach. Interestingly enough, although a victim of the Copernicanism and Newtonianism he inherited, Mach was on a continual search for at least some kind of absolute. He knew instinctively, as most physicists do, that this void had to be filled. It's quite unfortunate that they all turned their back on the fixed-Earth given to them by Christianity. Instead,

> Mach suggested referring all motion to the fixed stars (as in his well-known analysis of Newton's bucket experiment), or perhaps to a "medium" filling all of space (*i.e.*, ether), or to a mean velocity with respect to all the masses in the universe.[1197]

Mach's books (*Science of Mechanics*, *The Principles of Physical Optics* and *Analysis of Sensations*) had the greatest initial effect on Einstein.[1198] In the first book were two ideas that helped mold Einstein's thinking. The first is reflected clearly in…

> Einstein's insistence from the beginning of his relativity paper that the fundamental problems of physics cannot be understood until an epistemological analysis is carried out, particularly so with respect to the meaning of the conceptions of space and time; and second, by Einstein's identification of reality with

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[1196] Moritz Schlick, *Ernst Mach, der Philosoph*, in a special supplement on Ernst Mach in the *Neue Freie Presse*, Vienna, June 12, 1926, as cited in Holton, *Thematic Origins of Scientific Thought*, p. 240.

[1197] *Albert Einstein's Special Theory of Relativity*, p. 121.

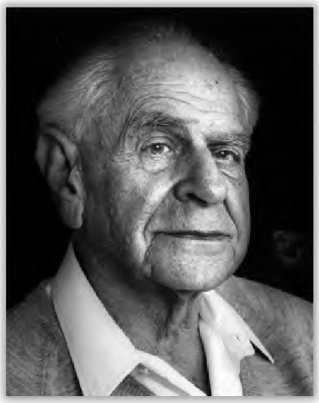
[1198] As Einstein stated in his *Autobiographical Notes* of 1946: "This book exercised a profound influence upon me….I see Mach's greatness in his incorruptible skepticism and independence; in my younger years, however, Mach's epistemological position also influenced me very greatly….As far as the history of science is concerned, it appears to me that Mach stands at the center of the development of the last 50 or 70 years" (p. 21).

> what is given by sensations, the "events," rather than putting reality on a plane beyond or behind sense experience.[1199]

Since Kant had created a deep chasm between our subjective thinking and the objective nature of reality, gone forever were the absolutes of Greek and Medieval thought. Whereas a balance existed in pre-Kantian times between nature and grace, after Kant, grace had all but been obliterated from man's thought process. The phenomenal world of particulars was likewise separated from the noumenal world of universals. From this, a movement toward determinism soon became prominent, first in physics and then in human disciplines, such as psychology, sociology and biology. As Arthur Miller states:

> Einstein no doubt found this book provocative….All of this discussion was based upon a framework whose dynamics were explained more clearly than by Hertz or von Helmholtz – that is, the neo-Kantian framework emphasizing the role of those organizing principles for thinking which admit of the validity, for example, of non-Euclidean geometrics.[1200]

As **Karl Popper** summed it up so well:



Karl Popper (1902 – 1994)

> In Kant's own striking formulation of this view, 'Our intellect does not draw its laws from nature, but imposes its laws on nature.' This formula sums up an idea which Kant himself proudly calls his 'Copernican Revolution.' As Kant puts it, Copernicus, finding that no progress was being made with the theory of the revolving heavens, broke the deadlock by turning the tables, as it were: he assumed that it is not the heavens which revolve while we the observers stand still, but that we the observers revolve while the heavens stand still. In a similar way, Kant says, the problem of scientific knowledge is to be solved – the problem how an exact science, such as Newtonian theory, is

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[1199] Holton, *Thematic Origins of Scientific Thought*, p. 242.
[1200] *Albert Einstein's Special Theory of Relativity*, p. 121.

> possible, and how it could ever have been found. We must give up the view that we are passive observers, waiting for nature to impress its regularity upon us. Instead we must adopt the view that in digesting our sense-data we actively impress the order and the laws of our intellect upon them. Our cosmos bears the imprint of our minds.
>
> By emphasizing the role played by the observer, the investigator, the theorist, Kant made an indelible impression not only upon philosophy but also upon physics and cosmology. There is a Kantian climate of thought without which Einstein's theories or Bohr's are hardly conceivable; and Eddington might be said to be more of a Kantian, in some respects, than Kant himself.[1201]

Popper then posits that the Kantian methodology applied the salve to the wound caused by Copernicanism:

> There is a second and even more interesting meaning inherent in Kant's version of the Copernican Revolution, a meaning which may perhaps indicate an ambivalence in his attitude towards it. For Kant's Copernican Revolution solves a human problem to which Copernicus' own revolution gave rise. Copernicus deprived man of his central position in the physical universe. Kant's Copernican Revolution takes the sting out of this. He shows us not only that our location in the physical universe is irrelevant, but also that in a sense our universe may well be said to turn about us; for it is we who produce, at least in part, the order we find in it; it is we who create our knowledge of it. We are discoverers: and discovery is a creative art.[1202]

By the time Einstein came on the scene, a "creative art" is precisely what the scientific endeavor became. Man now visualized himself riding on moonbeams, growing older than his twin brother, and seeing matter shrink when it moved. Once Kant opened the floodgates, man could, in an almost god-like fashion, impose his thoughts on the universe and mold it anyway he saw fit, backed up, of course, with mathematical equations that gave it a veneer of credibility.

[1201] *Conjectures and Refutations: The Growth of Scientific Knowledge*, pp. 180-181.

[1202] *Ibid.*, p. 181.

Under the influence of Kant and later philosophers such as Hegel, Heidegger, and a few other German and French philosophers, scientific thinkers of Ernst Mach's breed became commonplace in Europe. In fact, the whole concept of "relativity" sprung out of this crucible. Einstein's 1905 paper, which converged on many fronts with Mach's philosophical ideas was, according to Holton,

> …enthusiastically embraced by the groups who saw themselves as philosophical heirs of Mach, the Vienna Circle of neopositivists and its predecessors and related followers, [relativity] providing a tremendous boost for the philosophy that had initially helped to nurture it. A typical response welcoming the relativity theory as "the victory over the metaphysics of absolutes in the conceptions of space and time…a mighty impulse for the development of the philosophical point of view of our time," was extended by Joseph Petzoldt in the inaugural session…in Berlin, 11 November 1912.[1203]

Hence, we see that this was a philosophical war. The "victory over the metaphysics of absolutes" was the battle cry against the Aristotelian and Platonic ideals that had permeated classical thought and helped give philosophical structure to Christian thought in the work of Augustine and Aquinas. This is precisely why the issue of whether the Earth is the immobile center of the universe is so vitally important, something that these "neopositivists" understood all too well. Once Copernicus, Kepler, Newton, and now Einstein, had removed that universal absolute, no one could stand in the way of the philosophical juggernaut that would issue from it. When the results from Arago, Airy, Fizeau, and Michelson-Morley threatened to pop the bubble of "victory over absolutes" (since they demonstrated physical evidence of the likelihood that Earth was fixed in space), we can understand why Einstein became such a revered icon of modern man. With or without Mach, he saved them from a fate worse than death. With Einstein's magic, the Earth would remain moving.[1204]

[1203] *Thematic Origins of Scientific Thought*, p. 243.

[1204] Ironically, Mach rejected the Special Theory of Relativity based on the fact that it was not founded on empirical evidence. Mach writes in 1913: "I gather from the publications which have reached me, and especially from my correspondence, that I am gradually becoming regarded as the forerunner of relativity….I must, however, as assuredly disclaim to be a forerunner of the relativists as I personally reject the atomistic doctrine of the present-day school, or church" (*ibid.*, p. 248). Einstein laments: "The theory was, for him, inadmissibly speculative. He did not know that this speculative character belongs also to

Mach's Interpretation of Newton's Bucket

Now we are ready for Mach's interpretation of the "bucket" experiment. Since Mach held that all knowledge was derived from sensation, he refused to accept any postulate of natural science that was not verified empirically. This prompted him to deny Newton's concept of absolute space. He writes:

> The one experiment [Newton's bucket] lies before us, and our business is, to bring it into accord with the other facts known to us, and not with the arbitrary fictions of our imagination."[1205]

He argued, rather, that as the water curved upwards inside the bucket it was reacting to all the mass and gravitysurrounding it, including the Earth but mostly the stars. Whereas Newton said the water was rising relative to absolute space and that the observer witnessed the event with absolute space as his foundation, Mach said the water was rising relative to absolute gravity and that the observer viewed the event with the external mass as his foundation. In doing so, Mach obviously rejected absolute space as the foundation. He writes:

> Newton's experiment with the rotating water bucket teaches us only that the rotation of water relative to the bucket walls does not stir any noticeable centrifugal forces; these are prompted, however, by its rotation relative to the mass of the Earth and the other celestial bodies.[1206]

Mach's general point is that, since Newton fixated on absolute space, he did not take into account relative motion, that is, the water was rotating relative to all the matter in the universe such that if there were no other matter, the water surface would not become concave. Mach also discounted Newton's thought experiment concerning the two globes,

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Newton's mechanics, and to every theory [of] which thought is capable. There exists only a gradual difference between theories, insofar as the chains of thought from fundamental concepts to empirically verifiable conclusions are of different lengths and complications" (From *Zur Enthüllung von Ernst Machs Denkmal*, n. 13, as cited in *Thematic Origins of Scientific Thought*, p. 250).

[1205] Ernst Mach, *The Science of Mechanics: A Critical and Historical Account of its Development*, published 1883, trans., T. J. McCormack, 1960, p. 284.

[1206] *Ibid*. Mach further pointed out that if the water in the bucket was "several leagues thick" and thus of great mass itself, we could not predict how it would respond to the mass outside of it.

stating that if there were no universe against which the globes would rotate, we would not know that the globes were rotating.

In another work relating to Newton's bucket experiment, Mach says something that reflects deeply on the geocentric issue:

> Obviously, it doesn't matter if we think of the Earth as turning round on its axis, or at rest while the fixed stars revolve round it. Geometrically these are exactly the same case of a relative rotation of the Earth and the fixed stars with respect to one another. But if we think [as in Newton's view] of the Earth at rest and the fixed stars revolving round it, there is no flattening of the Earth, no Foucault's experiment, and so on – at least according to our usual conception of the law of inertia. Now one can solve the difficulty in two ways. Either all motion is absolute, or our law of inertia is wrongly expressed. I prefer the second way. The law of inertia must be so conceived that exactly the same thing results from the second supposition as from the first. But in this it will be evident that in its expression, regard must be paid to the masses of the universe.[1207]

Geocentrism, of course, opts for a hybrid of Newton's and Mach's views, which holds the Earth is at rest and the stars rotate, but the gravity of the stars influence the forces we experience on Earth. Additionally, since the Earth is fixed, all motion is, indeed, absolute, since motion can be measured against one, and only one, absolute point. In any case, Einstein recognized Mach's view in his 1920 paper, stating:

> Mach tried to avoid having to accept as real something which is not observable [absolute space] endeavoring to substitute in mechanics a mean acceleration with reference to the totality of the masses in the universe in place of an acceleration with reference to absolute space. But inertial resistance opposed to relative acceleration of distance masses presupposes action-at-a-distance; and as the modern physicist does not believe that he may accept this action-at-a-distance, he comes back once more, if he follows Mach, to the ether, which has to serve as the medium for the effects of inertia.[1208]

[1207] As cited in William G. V. Rosser's, *An Introduction to the Theory of Relativity*, 1964, p. 454, from Dennis Sciama's, *The Unity of the Universe*, 1959.

[1208] 1920 Leyden address, para. 19.

The geocentrist explains the above problem very simply: all the matter in the universe is more or less equally distributed around the Earth, and thus its mutual gravitational attraction is canceled at the neutral point, Earth, the center of mass, as required by Newtonian physics. We, however, experience the effect of the universe's collective gravitational force in the form of the phenomenon we know as "inertia." Inertia is the property in which an object remains at rest, or remains in motion if it is already in motion, unless acted upon by a net external force. The rotating universe creates a ubiquitous and balanced force around the Earth whose primary responsibility is to keep the Earth in place so that it cannot be moved (as the barycenter of a spinning gyroscope remains in place). Since the force is balanced, we do not feel it, unless we move against it (as when we try to turn the gyroscope or suddenly put on the brakes in a moving car). Moreover, the rotation of the universe around the Earth creates the additional forces we understand as centrifugal, Coriolis and Euler forces. These gravitational forces are transmitted (*i.e.*, "action-at-a-distance") through the universal ether, and we see its differing effects in the various forces we experience (*e.g.*, inertia, centrifugal, *etc*.). Since the ether is dense and supergranular, it can transmit the forces very rapidly.

Einstein's View of Newton's Bucket

As noted previously, the pre-1916 Einstein wanted to dismiss the concept of a "medium" because he thought the Michelson-Morley and similar experiments demonstrated that ether did not exist. As Einstein saw it, if we allow Mach's view, that is, there is inertial resistance between the Earth and the distant stars, then something must carry that resistance, even as air carries sound. For the record, Mach never explained how the stars transmitted their forces to the Earth.[1209] Since in Einstein's view there was no difference between inertial resistance and gravitation (which he claimed to have proven by his elevator analogies), he simply replaced Mach's inertial resistance with gravitation. Hence, the Earth was not in inertial resistance against the stars; rather, the Earth was affected, at least partially, by the gravity from the stars. Of course, one might object that Einstein's gravity also needs a "medium" to travel from the stars to the Earth, and thus he does not escape the need for ether. As we noted, Einstein had his particular ways of dealing with this issue. He writes:

[1209] As Assis notes: "Mach proposed that the distant matter (such as the fixed stars) establishes a very good inertial system. But he did not explain how this connection between the distant stars and the locally determined inertial frames might arise. He stimulated thinking in the right direction, although he did not supply the key to unlock the mystery. Another point is that he did not show how the spinning set of stars can generate centrifugal forces. The same can be said of Leibniz, Berkeley and all the others. Mach suggested that nature should behave like this, but he did not propose a specific force law that possessed this property" (Andre K. T. Assis, *Relational Mechanics*, pp. 122-123).

> According to this theory the metrical qualities of the continuum of space-time differ in the environment of different points of space-time, and are partly conditioned by the matter existing outside the territory under consideration. This space-time variability of the reciprocal relations of the standards of space and time, or, perhaps, the recognition of the fact that "empty space" in its physical relation is neither homogeneous nor isotropic, compelling us to describe its state by ten functions (the gravitational potentials *g*), has, I think, finally disposed of the view that space is physically empty.[1210]

Thus, to replace Mach's continuous stream of inertial communication between the stars and the Earth, Einstein proposes that there are pockets of varying gravitational effects all over the universe which are caused both by the objects in the vicinity of the "territory under consideration" (*e.g.*, Earth and the water bucket) and "matter existing outside" (*e.g.*, the distant stars). To what degree the "matter existing outside" affects the "territory under consideration" Einstein does not specify, nor does he explain how such distant matter transmits its affects to Earth, other than to say that there are "ten functions of gravitational potentials,"[1211] which means he will resort to mathematics to explain their existence, not physical evidence.

In any case, Einstein has given us enough information to understand how he will explain Newton's spinning bucket of water. These distant stars, which can be considered as one massive body, form a universal enclosure around the "territory under consideration," and, according to General Relativity, they will create space-time dimensions on the bodies within that "territory." In the case of the bucket, the water climbs the inside walls because, as the water rotates against the masses near it (*e.g.*, Earth, moon, sun, planets) and far from it (*e.g.*, stars, galaxies, black holes), its inertial movement will create a different space-time environment or "gravitational potential" as opposed to what the water had at rest. In a crude sort of way, Einstein posits that the water curves because the space surrounding it curves. Hence, to avoid Mach's position, Einstein can say that the stars are not *directly* affecting the water, and thus there is no need for a mechanical ether to transmit their force to the water; rather, the stars are only *indirectly* affecting the water by helping to change the space-time dimensions surrounding the water. Since these space-time dimensions do not travel from the stars to the water in the bucket but continually affect space-time dimensions throughout the universe by their ubiquitous existence, then there is no need for what Einstein calls, an "undulating ether" to carry their effects. Thus he concludes:

[1210] 1920 Leyden lecture, para. 20.

[1211] These are Einstein's famous "metric tensor fields" or "dimensions of curvature," a mathematical composite of 20 components (10 of which are independent and 10 of which are zero) that characterize the fabric of space-time in General Relativity.

> But therewith the conception of the ether has again acquired an intelligible content, although this content differs widely from that of the ether of the mechanical undulatory theory of light. The ether of the general theory of relativity is a medium which is itself devoid of all mechanical and kinematical qualities, but helps to determine mechanical (and electromagnetic) events.[1212]

[1212] 1920 Leyden lecture, para. 20. As noted earlier, Einstein candidly admits, however, that his concept of gravitational ether cannot account for electromagnetic activity, since if space is created by gravity, then there is no place for electromagnetic activity to operate independently. This is further complicated by the fact that to Einstein, matter and the electromagnetic field are intimately related, such that matter is "nothing else than condensations of the electromagnetic field" (*ibid*, para. 24). He then says "it would be a great advance if we could succeed in comprehending the gravitational field and the electromagnetic field together as one unified conformation," but this wish, which he attempted to forge in the Unified Field Theory, never materialized. This failure, of course, suggests that the basic premises of Relativity theory are wrong. In another light, John Wheeler, et al., state: "A model universe that is closed, that obeys Einstein's geometrodynamic law, and that contains a nowhere negative density of mass-energy, inevitably develops a singularity. No one sees any escape from the density of mass-energy rising without limit. A computing machine calculating ahead step by step the dynamical evolution of the geometry comes to the point where it cannot go on. Smoke, figuratively speaking, starts to pour out of the computer…" (Charles W. Misner, Kips S. Thorne, and John A. Wheeler, *Gravitation*, 1973, p. 1196). Barbour and Bertotti add: "In 1908, Newton's absolute space and time were replaced by the equally absolute Minkowskian space-time. It is important to note that the local validity of special relativity, however well tested, can no more prove the existence of Minkowskian space-time than the bucket did Newton's space." In regard to General Relativity, they state: "To the extent that general relativity, which conceptually is a completely local theory…it is perhaps understandable that it is able to predict other local phenomena with great accuracy. However, the only real tests of general relativity are those that have been carried out in the solar system, under nearly stationary conditions, and for X values smaller than 10^{-6}" (J. B. Barbour and B. Bertotti, Although Einstein tried his best to present a non-mechanical and non-kinematical ether to the world, not everyone was buying into it. As noted previously, Dayton Miller's experiments had come into full bloom a few years after Einstein's 1920 Leyden lecture, and thus the possibility of a mechanical ether simply would not go away, which is quite remarkable, since Miller was a heliocentrist who interpreted his interferometer experiments from the perspective that the Earth was moving at 30 km/sec. Yet even from that difficult perspective there were strong indications that a material ether existed. In 1923 Ernst Gehrcke reexamined the Michelson-Morley, Michelson-Miller and Georges Sagnac experiments, not to mention Michelson-Gale, and demonstrated how Relativity theory fell far short of explaining them.

These indications were strong enough that Einstein decided to address the issue in a book with Leopold Infeld in 1938 titled *The Evolution of Physics*. Einstein writes:

> Is the ether carried with a room as the air was? Since we have no mechanical picture of the ether it is extremely difficult to answer this question. If the room is closed, the air inside is forced to move with it. There is obviously no sense in thinking of ether in this way, since all matter is immersed in it and it penetrates everywhere. No doors are closed to ether. The "moving room," now means only a moving CS [coordinate system] to which the source of light is rigidly connected. It is, however, not beyond us to imagine that the room moving with its light source carries the ether along with it just as the sound source and air is carried along in the closed room. But we can equally well imagine the opposite: that the room travels through the ether as a ship through a perfectly smooth sea, not carrying any part of the medium along but moving through it. In our first picture, the room moving with its light source carries the ether. An analogy with a sound wave is possible and quite similar conclusions can be drawn. In the second, the room moving with its light source does not carry the ether. No analogy with a sound wave is possible and the conclusions drawn in the case of a sound wave do not hold for a light wave. These are the two limiting possibilities. We could imagine the still more complicated possibility that the ether is only partially carried by the room

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"Gravity and Inertia in a Machian Framework," *Il Nuovo Cimento*, 32B(1), March 11, 1977, pp. 26-27). As we will see in Appendices 5, 6, 7, and 8, even Einstein's "solar system" tests never proved General Relativity.

> moving with its light source. But there is no reason to discuss the more complicated assumptions before finding out which of the two simpler limiting cases experiment favors.[1213]

Einstein explains why he cannot accept either of these possibilities:

> Every attempt to explain the electromagnetic phenomena in moving CS [coordinate systems] with the help of the motion of the ether, motion through the ether, or both these motions, proved unsuccessful….Thus arose one of the most dramatic situations in the history of science. All assumptions concerning ether led nowhere! The experimental verdict was always negative. Looking back over the development of physics we see that the ether, soon after its birth, became the "*enfant terrible*" of the family of physical substances. First, the construction of a simple mechanical picture of the ether proved to be impossible and was discarded. This caused, to a great extent, the breakdown of the mechanical point of view. Second, we had to give up hope that through the presence of the ether-sea one CS [coordinate system] would be distinguished and lead to the recognition of absolute, and not only relative, motion. This would have been the only way, besides carrying the waves, in which ether could mark and justify its existence. All our attempts to make ether real failed. It revealed neither its mechanical construction nor absolute motion. Nothing remained of all the properties of the ether except that for which it was invented, *i.e.*, its ability to transmit electromagnetic waves. Our attempts to discover the properties of the ether led to difficulties and contradictions. After such bad experiences, this is the moment to forget the ether completely and to try never to mention its name. We shall say: our space has the physical property of transmitting waves, and so omit the use of a word we have decided to avoid. The omission of a word from our vocabulary is, of course, no remedy. Our troubles are indeed much too profound to be solved in this way![1214]

Of course, to today's Relativist, all this sounds so inviting. Here we have a theory that apparently solves the problem of having to find the elusive ether; dispenses with the metaphysics of absolutes; makes a plausible connection between the distant stars and Earth; and, most of all, saves mankind from having to admit the possibility of a motionless Earth. As we have noted previously, however, the theory of Relativity was created under the misinterpretations of stellar aberration, interferometer, and other similar experiments. Since it was assumed in each case that the Earth was moving at 30 km/sec, invariably each experiment was interpreted as giving a null result for the existence of a mechanical ether. If Einstein and modern science had stopped for one brief moment to analyze those experiments from the perspective of a motionless Earth, they would have had positive proof of the ether's existence. The so-called "difficulties and contradictions" would have disappeared, for each experiment invariably showed a small positive result, a result consistent with a universe rotating in a sea of ether around the Earth as its immovable center. Having failed to grasp this truth, Einstein was forced into the fantastic contortions of time and space that we witness above, which, in the end, leave no room for the very thing that began his trek – electromagnetic activity. In fact, the effects of electromagnetic activity in the Sagnac and similar experiments demonstrate that absolute motion exists, and not even the mighty equations of General Relativity could dismiss that incontrovertible fact. (See Chapter 9 for continuing discussion of the origin and nature of centrifugal and Coriolis forces).

[1213] Albert Einstein and Leopold Infeld, *The Evolution of Physics*, 1938, 1966, pp. 167-168.

[1214] *Ibid*., pp. 175-176.

The Inherent Problems of Newton's and Einstein's Physics

In the end, the Newtonian and Einsteinian systems are mere mathematical representations of physical forces for which neither system provides real physical answers. Newton developed a physics that interpreted, in mathematical terms, the force of interaction between two bodies, but which was totally independent of the reference frame in which those bodies were contained. The formulas $F = ma$ and $F = Gm_1m_2/r^2$ work only in unaccelerated reference frames. When Newton's formulas are applied to accelerating frames of reference, they do not work unless compensations are added. In an accelerated frame, the two bodies begin to accelerate without a force being applied to them. Hence, Newton's math must be adjusted to compensate for acceleration, and this is accomplished by adding in fictitious components, otherwise known as centrifugal, Coriolis, and other forces. But centrifugal and Coriolis forces, even though measurable, are not products of matter or energy in the Newtonian system. Newton could not explain from whence they originated. Consequently, they are mere inventions of the human mind so as to allow Newton's math equations to balance. Evidently, something is missing. As C. Møller writes:

> For example, if we consider a purely mechanical system consisting of a number of material particles acted upon by given forces…Newton's fundamental equations of mechanics may be applied with good approximation….On the other hand, if we wish to describe the system in an accelerated system of reference, we must introduce, as is well known, so-called fictitious forces (centrifugal forces, Coriolis forces, etc.) which have no connexion whatever with the physical properties of the mechanical system itself….It was just for this reason that Newton introduced the concept of absolute space which should represent the system of reference where the laws of nature assume the simplest and most natural form. However…the notion of absolute space lost its physical meaning as soon as the special principle of relativity was generally accepted, for as a consequence of this principle it became impossible by any experiment to decide which system of inertia had to be regarded as the absolute system.[1215]

Since Newton was a Copernican and thus did not have a fixed Earth from which to formulate his laws of motion, he ran into several difficulties, if not contradictions, in his formulas. As Dennis Sciama explains it:

> Newton's second law can be expressed in the familiar form: force is mass times acceleration. When we look carefully at this law we find a curious difficulty. For, while the force acting on a body is objectively determined by whatever is exerting the force, the value of the acceleration depends on how it is measured, that is, on which body is taken as providing a standard of rest….A similar example of this difficulty is provided by the motion of artificial satellites. The ones which have been launched so far have circled the earth in an hour or two. But the farther out a satellite is, the longer it takes to complete its orbit. At a certain height it will take just twenty-four hours. If a satellite at this height were to move parallel to the equator and in the same direction as the earth rotates, it would always be above the same point of the earth's surface. Someone looking up would see a

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[1215] C. Møller, *The Theory of Relativity*, 1958, pp. 218-219.

> body at rest above his head, hovering with no visible means of support! These examples show that Newton's second law applies only if the accelerations of bodies are measured in a special way. Since Newton believed his law to be fundamental, he supposed that accelerations measured in such a way that his law applies are of particular significance, and he called them *absolute*. Newton's second law should now be amended to read: force is mass times absolute acceleration. Those bodies on which no forces act will then have no absolute acceleration. Such bodies are said to constitute an *inertial frame of reference* or simply an inertial frame, because accelerations measured relative to them will be absolute accelerations. Consequently for Newton's second law to be satisfied accelerations must be measured relative to an inertial frame of reference.
>
> Inertial frames naturally play a fundamental role in Newton's theory. Nevertheless, he often found it convenient to use a *non-inertial* frame of reference – that is, to measure accelerations relative to some body whose absolute acceleration is not zero…This procedure leads, of course, to anomalies, in particular that a force may produce no acceleration at all. Nevertheless, Newton was able to adapt his law of motion to fit this situation by postulating the existence of some *additional* forces, which do not have a physical origin in material objects. These additional forces, commonly called inertial forces, are needed to compensate for measuring accelerations relative to a non-inertial frame of reference.[1216]

So we see that Newton needed to measure motion by means of a fixed frame, but having none (because Copernicus removed the possibility of a fixed Earth), he created his own fixed frame, which he called "absolute space." For Newton, the Earth was moving, but absolute space was immobile (a picture which is the exact opposite of what Scripture reveals to us). Thus Newton determined that all motion would be measured against this unseen yet ubiquitous spatial fortress. In order to provide evidence that absolute space existed, Newton introduced his water bucket experiment noted above. He held that, the degree to which the water curved upward would reveal the amount of absolute rotation the water possessed as measured against the immobile space surrounding it. Of course, as others pointed out, this didn't prove the existence of absolute space; rather, it only proved that the water was curving upward against *something*, but its exact identity remained a mystery. In reality, Newton was forced to answer the water bucket problem by appealing to absolute space because he had no other choice, namely, he did not believe it could be cause by the stars, the Earth, or the bucket.[1217]

[1216] Dennis Sciama, *The Unity of the Universe*, pp. 85-89.

Einstein thought of another way to solve these problems. To answer Newton's dilemma of having to add centrifugal and Coriolis forces, in the theory of General Relativity Einstein invented "curved space" so as to give matter itself the ability to obey Newton's laws without an external force being applied to the matter. The "force," as it were, came from the curved space which, when a body followed its curved path, made it appear as if it was accelerating. Einstein didn't have an explanation as to why the body followed the curved path (especially with no force pushing it), or how gravity could curve the vacuum of space, or even why an object would follow the so-called "geodesic" path. Moreover, since acceleration and gravity are locally equivalent in General Relativity, then the gravity caused by "curved space" becomes, in essence, another fictitious force similar to Newton's that allows the math equations to balance.[1218] The major problem for Einstein, of course, is that the mathematics cannot reveal whether the phenomenon is a fictitious force caused by curvature or a genuine force caused by something else. In fact, Einstein produced his

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[1217] Newton's system has the same problem with explaining the atomic world. As Robert Laughlin puts it: "Early in the twentieth century it was discovered that atoms, molecules, and subatomic particles are described by the laws of quantum mechanics – rules so different from Newton's that scientists struggled to find proper words to describe them. Newton's laws make profoundly false predictions at this scale, such as atoms having zero size and solids having huge heat capacities at zero temperatures that they do not, in fact, have. A beam of helium atoms projected onto an atomically perfect solid surface does not bounce off in all directions, as Newton's laws predict, but diffracts into rainbows as a beam of light would do. Atoms are not billiard balls at all but waves, as are their constituents, which bind together to form atoms the way waves of water bind to make a surge. Thus Newton's legendary laws have turned out to be emergent. They are not fundamental at all but a consequence of the aggregation of quantum matter into macroscopic fluids and solids" (*A Different Universe*, p. 31).

[1218] As Assis quips: "…the theoretical concepts of length contraction, time dilation, Lorentz invariance, Lorentz's transformations, covariant and invariant laws, Minkowski metric, four-dimensional space-time, energy-momentum tensor, Riemannian geometry applied to physics, Schwarzschild line element, tensorial algebras in four-dimensional spaces, quadrivectors, metric tensor $g_{\mu\nu}$, proper time, contravariant four vectors and tensors, geodetic lines, Christoffel symbols, super strings, curvature of space, etc. have the same role as the epicycles in the Ptolemaic theory" (Andre K. T. Assis, *Relational Mechanics*, p. 159).

General Relativity field tensors by finding a math equation that he could work backward into Newton's force equations,[1219] and because of that fateful step, his theory will be tied to the fate of the Newtonian theory. In the end, without physical proof of its existence, Einstein's curved space is just as fictitious as Newton's additional inertial forces (*e.g.*, centrifugal and Coriolis forces).[1220]

Einstein, however, has an even deeper problem explaining Newton's bucket. When the relativistic mathematics is applied to the bucket, it shows both an additional force that has no analogue to the Newtonian centrifugal force, as well as a Coriolis force that is five times the strength as the Newtonian Coriolis. These mathematical results occur when, using General Relativity's own principle of equivalence, the stellar frame is rotated around the bucket rather than kept fixed. As Assis explains it:

> But in Einstein's general theory of relativity a strange things happens. Although the fixed stars and distant galaxies exerted no force on the water in frame O in which the stars and distant galaxies were seen at rest, the same does not happen in this

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[1219] The 8π component in Einstein's field equation, G = 8πT (in which G is the Einstein tensor and T is the stress or energy-momentum tensor), was added by determining what factor was necessary in order to make Einstein's equation equal to Newton's equation. This is why General Relativists, such as Misner, Thorne and Wheeler, can say: "The field equation [G = 8πT] even contains within itself the equations of motion ("Force = mass x acceleration") for the matter whose stress-energy generates the curvature." Consequently, they have no qualms in saying that G = 8πT "…is elegant and rich. No equation of physics can be written more simply, and none contains such a treasure of applications and consequences. The field equation shows how the stress-energy of matter generates an average curvature (G) in its neighborhood…The field equation [G = 8πT] governs the motion of the planets in the solar system; it governs the deflection of light by the sun; it governs the collapse of a star to form a blackhole; it governs the evolution of spacetime singularities at the end point of collapse; it governs the expansion and recontraction of the universe. And more; much more" (*Gravitation*, pp. 42-43). The expanded Einstein field equation is $R_{ab} - ½Rg_{ab} = -8πGT$, where g is the metric tensor, R_a is the Ricci tensor, R is the scalar curvature and T is the energy-momentum tensor. Einstein's original equation included the infamous cosmological constant Λ, and was written as $R_{ab} - ½Rg_{ab} + Λg_{ab} = -8πGT$.

[1220] As Reginald Cahill concludes: "…Newtonian gravity is known to be seriously flawed, and so ipso facto, by using this postulate ["In the limit of low speeds the gravity formalism should agree with Newtonian gravity"] Einstein and Hilbert inadvertently developed a flawed theory of gravity….Newtonian gravity failed because it was expressed in the limited formalism of the gravitational acceleration field g" ("The Einstein Postulates: 1905-2005: A Critical Review of the Evidence," in *Einstein and Poincaré*, pp. 131, 135).

> frame O' of the bucket in which the stars and galaxies are seen rotating with…the angular rotation of the bucket and water relative to O. Now, due to the Thirring's force, there will appear a real gravitational force exerted by the spinning distant matter on the water. This force did not exist in the frame of reference O. The problem is that this new force is not exactly the Newtonian fictitious centrifugal force. In it appears the new axial term…which has no analogue in the Newtonian theory….In Newtonian mechanics the situation was much better and more coherent…Neither the centrifugal force nor *ma* [from *F* = *ma*] had any relation to the distant galaxies. But in general relativity we have a gravitational frame-dependent force….according to Thirring's expression, there will be a real gravitational influence of the distant galaxies on the water.[1221]

We will cover "Thirring's expression" more deeply in Volume II under "Thirring's Geocentrism." For now, we will also note the even greater effect that Thirring's mathematics has on Einstein's Coriolis force. Assis notes:

> It might be thought that this is a negligible effect, but this is not the case. When we integrate Thirring's force over the whole known universe we obtain forces of classical mechanics. The equation[1222] gives the gravitational force exerted by the spinning universe on any body, according to general relativity. It has the same order of magnitude as the classical Coriolis and centrifugal forces. But the form and numerical values of Thirring's force are different from the classical ones. This means that Foucault's pendulum or the flattening of the earth, when analyzed from the earth's frame of reference in which the distant galaxies are seen as rotating, should, according to general relativity, have values different from those observed experimentally. This is one of the main quantitative flaws of general relativity….the analogous to Coriolis force is 5 times larger than the analogous to the centrifugal one….[This] shows that general relativity cannot

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[1221] Andre K. T. Assis, *Relational Mechanics*, p. 154.

[1222] From Thirring's 1921 equation [and also Peizoto, Rosa and Pfister] as (&= 8 À Æ / 5 9 Ë·Ö > I ,ñ H:ñ, H&, ÈN s r I,Q H,‹ Ëñ t: ñ ®&,ñ ?and replacing *M* by *dM* = $4\pi R^2$!*dR* and integrating from zero to Hubble's radius such that $R_o = c/H_o$ yields: (&L < À / 5 9 Á > I ñ,‹ H:ñ, H&, ÈN s r I,Q H,‹ Ëñ t: ñ ®&,ñ ?and where ! ≈ 10^{-27} kg/m^3 universe density.

> cope with Newton's bucket or two globes experiments in all frames of reference.[1223]

Are There Universal Connections in Space?

As Mach and Einstein struggled with the connection between the stars and the water bucket, this dilemma brings us back to the question of how the universe communicates with itself. If space is not a vacuum and is filled with something, it is probably no surprise that several experiments appear to indicate that particles are mysteriously connected, appearing to communicate with each other even when separated by great distances. What one photon does will be replicated by a twin photon across space, even though there is nothing immediately detectable connecting the two photons. It is as if some mysterious force and communication were making each photon perform the same movement.

These strange happenings were just beginning to be noticed back in the early 1800s when Thomas Young demonstrated that light passing through two adjacent slits produces interference patterns.[1224] In 1909 Goeffrey Taylor discovered that photons from sources as feeble as a candle produce interference lines. The basic question was: with what are the photons interfering in order to make interference patterns?[1225] At one point Paul Dirac was led to postulate that "…each photon then interferes only with itself."[1226]

In 1923, Clinton Davisson and Charles Kunsman reported a similar phenomenon with electron diffraction. In the same year Louis de Broglie found that all objects have properties of waves.[1227] The lighter the object, proposed that the aforementioned particles also consisted of, and traveled in, waves. He was not sure himself precisely what this meant, since it was the result of the mathematical calculations he derived from experiments left to him by previous scientists studying the nature of the atom, especially Niels Bohr, who published his work about ten years earlier. Bohr understood the atom as consisting of electrons orbiting a nucleus of protons and neutrons. Bohr said that the electrons could orbit only at defined energy levels but at no place in between those levels. As the electrons orbit the nucleus, they naturally possess angular momentum (the phenomenon responsible for the behavior of an ice skater who spins faster as she brings her arms in close to her body). Knowing the angular momentum, one could then calculate the electron's speed, orbital radius, and kinetic and potential energy for each specific orbit. The electrons are free to move from one level to another. If they move to a lower energy orbit, they will release energy; if they move to a higher energy orbit, they will absorb energy. The amount of energy will equal the energy difference between the orbits. Hence, for illustration purposes only, if the energy of orbit level 1 is 10, and that of orbit level 2 is 20, the photon that is released or absorbed will possess an energy of 10. About two decades earlier, Max Planck determined that energy comes in precise amounts. For example, molecules (groups of atoms) vibrate at certain frequencies but cannot vibrate at intermediate frequencies. Planck stumbled onto the smallest numerical difference between the various frequencies, and it was assigned a value of 6.626×10^{-34} joule-seconds, which is represented by the symbol *h*. (A joule is the standard unit of energy which is attained by measuring the angular momentum, or spin energy, of a rotating or vibrating object.) The energy of the molecule is thus determined by its frequency of vibration multiplied by *h*. This value became known as *Planck's constant*. Einstein, after the famous photoelectric experiments of 1905 (wherein he directed light beams onto metal surfaces and found that a certain amount of light caused a specific number of the metal's electrons to be released), then proposed that the energy in light can only exist in certain values. The smallest unit of light-energy was called a photon. As one photon of light hit the metal plate, one electron would be released from the metal plate. The energy value of a photon would be its frequency (vibrational energy) multiplied by Planck's constant, *h*. In this model, photons are understood as particles. In other experiments, however, light behaves also as a wave. A wave has no substance of its own, but is merely a periodic motion of the medium in which it travels. (For example, one creates a wave by applying an up-and-down motion to a whip. The wave of the whip has energy, for unless one holds onto the handle of the whip, it will be forcefully dislodged from one's hand.) However, a question left unresolved is: if light is a wave what is its medium? To this day, modern science does not know for certain whether light is a particle or a wave, a combination of the two, or perhaps neither and thus something altogether undiscovered. Because of this uncertainty, light is sometimes referred to as an "electromagnetic wave" and at other times as "photons." Enter Louis de Broglie. Intrigued with the fact that electrons possess angular momentum and that they discharge or absorb energy as they jump into different orbits, he wanted to find the reason for this behavior. Thus he proposed that electrons, and all matter, were not merely particles but also consisted of waves. Theoretically, everything from electrons to baseballs and beyond had a "wavelength" (λ), which could be measured by using Planck's constant, (h), divided by the object's momentum (p) in the equation $\lambda = h/p$. A big object, such as a pitched baseball, does not show a wavelength since its momentum multiplied by Planck's constant (6.626×10^{-34}) would yield a wavelength of less than 10^{-25} nanometers in size. That is twenty-four orders smaller than the diameter of an atom. But if electrons are or possess waves, then the idea of a particle whizzing around the nucleus had to be modified. The electron's relation to the nucleus was now understood as a wave filling the sphere of the atom. As waves, they won't discharge or absorb photons unless they change their energy level, which means they will change their wavelength, not their orbit. As in light waves, increasing the wavelength causes the frequency of the wave to decrease, and thus lowers the energy level of the electron, which in turn releases a photon. The opposite occurs when the wavelength is shortened. Erwin Schrödinger developed this model by employing more advanced equations. He concluded that electrons do not revolve around the nucleus at all; rather, the waves are stationary. Schrödinger's atom, like Bohr's, was electrical in nature, but the electric charge, rather than being contained in rotating electrons, is distributed throughout the entire atom. The electric charge may fluctuate and thus emit photons, or it may emit electrons, which in this case are considered as little bunches or "quanta" of electric charge split off from the main body of the atom, similar to flames coming off a burning log. To calculate the electrical energy, electrons were considered in terms of energy levels of stationary waves rather than particles circling the nucleus. The wavelengths for these atoms and electrons could be determined by the use of a mathematical system called "matrix mechanics" or Quantum Mechanics, but this was a purely mathematical explanation of the atom that had little if any pictorial description available. Interestingly enough, in light of the DeBroglie-Schrödinger theory, G. Bouw has proposed the following: "If the quantum law holds for the universe as a whole, we can imagine the universe to be a standing wave of wavelength (diameter) $\lambda = 4 \times 10^{28}$ cm (36 billion light years). Using Compton's formula $\lambda = h/mc$ where λ is the wavelength, h is Planck's constant, m is the effective mass of the particle, and c is the speed of light, we derive the effective mass of the universe as 5.5×10^{-66} gm, much much lighter than any known particle, photon or neutrino. That mass is only perceived at the edge of the universe. Any place else, even at the dynamic center which is, of course, the position of the Earth, perceived the mass of the universe to be 5.68×10^{56} gm" (*The Biblical Astronomer*, vol. 12, no. 99, 2002, pp. 15-16). Moreover, the Schrödinger atom requires a universal medium, since the atom itself has no definite boundary but theoretically extends into infinity, and thus all atoms are mysteriously united. As such, Schrödinger's model advanced the idea of a universal electric plenum, which would then be enhanced by the work of Paul Dirac. After some development of the model, in 1951 Dirac concluded: "We have now the velocity at all points of space-time, playing a fundamental part in electrodynamics. It is natural to regard it as the velocity of some real physical the more pronounced the wave effect. An object as small as the electron would thus act very much like a wave. In 1927 Davisson repeated the electron diffraction experiment with Lester Germer. They shot electrons through a piece of nickel crystal. Thinking that the electrons were like little bullets, the two scientists expected to see the electrons react accordingly. Instead, the electrons produced an interference pattern and thus reacted as if they were in wave motion, not particle or ballistic motion.[1228]

[1223] Assis, *Relational Mechanics*, pp. 154-157.

[1224] Thomas Young, "Experiments and Calculations Relative to Physical Optics," Bakerian Lecture, 1803, Philosophical Transactions of the Royal Society of London 94, 1-16.

[1225] Geoffrey I. Taylor, "Interference with Feeble Light," (Proceedings of the Cambridge Philosophical Society, 15, 114-115, 1909.

[1226] Paul Dirac, *The Principles of Quantum Mechanics*, 4th ed., p. 9.

[1227] In 1923, A. H. Compton performed an experiment shooting high frequency X-rays at various materials. He found that, after the X-ray bounced off the object, it had a slightly longer wavelength than the incident X-ray, which means it had lower energy. It also meant that the energy of the X-ray was partially being transferred to the material it hit (usually graphite). This exchange between the X-ray and the graphite followed the known laws of conservation of momentum and energy. The whole process is known as the Compton Effect, and it supported the idea that energy traveled in very tiny but independent packets. The packets were called photons and they were considered particles. Later in 1923, Louis de Broglie

Other strange effects were also being catalogued. As one physicist describes them:

> …a fast-moving point mass passing a spherically-symmetric body causes the latter to rotate; a mass moving with rapidly-decreasing velocity exerts both an attractive and a repulsive force on neighboring bodies; a fast-moving mass passing a stationary mass exerts an explosion-like force on the latter; a rotating mass that is suddenly stopped causes neighboring bodies to rotate; the period of revolution of a planet or satellite is affected by the rotation of the central body.[1229]

Niels Bohr (1885 – 1962)

As time went on, variations of the Davisson-Germer experiment were performed, evolving into the famous "double-slit" experiments.[1230] Eventually, a point was reached in which only one electron, about every ten seconds, was discharged towards the two slits. An amazing thing

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thing. Thus with the new theory of electrodynamics we are rather forced to have an ether" (*Nature* (London): 168: 906-907 (1951), as cited in *The Einstein Myth*, p. 102. Along with Dirac, in 1959 Louis de Broglie also began to reconsider the ether hypothesis. Later, Stark, Arrhenius, Lenard, Yukawa and Soddy began similar investigations).

[1228] Nickel has an atomic plane spacing of 0.0909 nanometers. If a beam of wavelength 1.17 nanometers is shot at it, the reflection will be at 40 degrees. This depends on the formula $n^{\lambda} = 2d \sin(\theta/2)$ where θ is the angle between the atomic planes; d is the incident beam; and n is a positive integer. George Thompson found the same results, sharing the Nobel Prize with Davisson in 1937.

[1229] Oleg D. Jefimenko, *Gravitation and Cogravitation*, 2006, p. vi.

[1230] In 1956 G. Möllenstedt and H. Düker split an electron beam and obtained an interference pattern (Zeitschrift für Physik 145, 377-397); in 1961 Claus Jönsson performed the first "double-slit" experiment with electrons, demonstrating interference patterns with up to five slits.

occurred: interference patterns were still being produced on the photographic plates. Apparently, the electron was "interfering" with something. In fact, the singly discharged electrons seemed to go through the slits alternately so that, as their markings were gradually observed building up on the collecting plate, they produced the same interference pattern as when thousands of electrons were shot at once at the two slits.[1231]

Prior to this, a huge theoretical war broke out between the followers of Albert Einstein and the followers of Niels Bohr.[1232] The former said the electrons were merely following already-programmed instructions built into them (*viz.*, "hidden variables"), whereas the latter claimed that the electrons randomly chose where they would hit, but also that there was some mysterious connection between them so that each electron knew what the other was doing and would act accordingly.

In 1932, John von Neumann gave a purported mathematical proof that the two theories could not be reconciled, but in 1952 David Bohm suggested that they could be reconciled, at least theoretically. In the double-slit experiment he held that a quantum wave was guiding each particle as it went through the slit. As the particle passes through the slit, so does its wave, and it is the wave that is causing the interference line on the screen. When both slits are open, a particle will pass through one slit or the other, but its wave travels through both slits, again causing the interference lines on the screen.

In 1964 **John Bell** had shown that the Einstein group was continuing to lose the battle. Using the fact that electrons have various spin orientations[1233] (*e.g.*, clockwise or counter-clockwise) Bell showed that if two electrons were placed back-to-back and sent to their respective

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[1231] Theoretically, this phenomenon was known to exist by the results of Davisson's experiments, but the theory could not be tested, at least completely, until the 1960s, and then not conclusively until the 1970s and 1980s. Experimental evidence was produced by P. G. Merli et al., "On the Statistical Aspect of Electron Interference Phenomena," *American Journal of Physics* 44, 306-307 (1976); Akira Tonomura et al, "Demonstration of Single-Electron Build-up of an Interference Pattern," *American Journal of Physics* 57, 117-120, (1989).

[1232] Einstein's supporters were Boris Podolsky and Nathan Rosen, who together wrote a paper in 1935 titled "Can Quantum-Mechanical Description of Physical Reality be Considered Complete?" versus the Copenhagen group headed by Bohr (Erwin Schrödinger, Max Born, Werner Heisenberg, et al.).

[1233] The fact that electrons spin and have a magnetic field was discovered in 1925 by S. Goudsmit and G. E. Uhlenbeck. Later it was also discovered that each atomic particle (proton, neutron, etc.) spins and possesses a magnetic field, but since neutrons have no electrical charge, the magnetic field cannot be due to the spin of the particle.

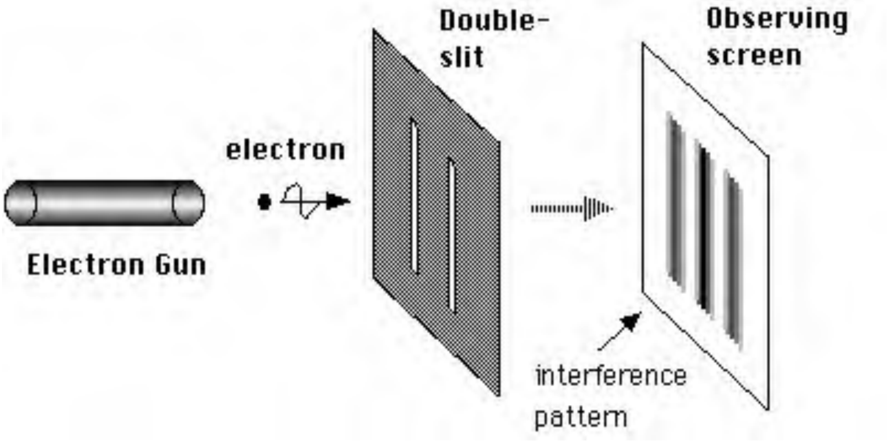
detectors an equal distance away, the electrons will invariably produce opposite spins. Moreover, it doesn't matter how far away the detectors are placed from each other, the results are always the same.[1234] This seems to indicate that one electron somehow knows what the other one is doing even when separated by a substantial distance.

In order for the Einstein group to explain this phenomenon, they would have to invoke a long-range physical force that connected the electrons, but this, of course, would immediately obliterate the theory of Relativity. Yet if Einstein employed short-range or "local" solutions (which is the essence of Relativity theory), he still could not produce the accurate answers provided by Quantum Mechanics, and this resulted in an "inequality" between Relativity and Quantum Mechanics, which is why the critique is called "Bell's Inequality" (but sometimes cited as "Bell's Theorem"). Following Bell's work, a whole host of physicists performed a series of experiments that confirmed Bell's critique of Einstein.[1235]

[1234] Further, if the electrons are tested for spin in two perpendicular directions, one particle goes left or right just as when the other one spins up or down. If they are tested for spin in the same direction, the proportion of times when the spins don't correlate increases as the square of the angle between the two directions, which is to be expected.

[1235] Beginning in 1968, several physicists confirmed "Bell's Inequality" using photons and protons (1968: Abner Shimony; 1972: Stuart Freedman and John Clauser; 1976: Edward Fry and Randall Thompson; 1982: Alain Aspect; 1986: Michael Horne; 1997: Nicolas Gisin; others include Anton Zeilinger, Richard Holt, M. Lamehi-Rachti, W. Mittig). In every case (except one which was later found to have experimental errors) quantum mechanics provided the correct answers and maintained its superiority over Einstein's "hidden variables" theory. For example, in 1972, Stuart Freedman and John Clauser state: "We have measured the linear polarization correlation of the photons emitted in an atomic cascade of calcium. It has been shown by a generalization of Bell's inequality that the existence of local hidden variables imposes restrictions on this correlation in conflict with the predictions of quantum mechanics. Our data, in agreement with quantum mechanics, violate these restrictions to high statistical accuracy, thus providing strong evidence against local hidden-variable theories" (*Physical Review Letters* 28, 938, 1972). See Amir D. Aczel's *Entanglement*, New York, Four Walls Eight Windows, 2001, and Nadeau and Kafatos' *The Non-Local Universe* (Oxford, 2001) for a comprehensive and entertaining history of this phenomenon.

Obviously, some profound phenomenon was occurring that neither Einstein nor Quantum Mechanics had the ability to answer. Einstein was limited by his wish to avoid a physical medium in space, and Quantum Mechanics was limited by the Heisenberg Uncertainty Principle. Since Einstein gave a fallacious interpretation to the Michelson-Morley experiment and fudged Maxwell's equations, he had already obliterated the concept of a material medium pervading all space; and since Quantum Mechanics did not know the origin of the wave that is attached to particles, everyone was at a loss to …explain the double-slit experiment. Weird and spooky interpretations inevitably followed (which these scientists often enjoyed because it elevated physics to a popular status). One such fantastic explanation comes from physicist John Gribbin:



> The electrons not only know whether or not both holes are open, they know whether or not we are watching them, and they adjust their behavior accordingly. There is no clearer example of the interaction of the observer with the experiment. When we try to look at the spread-out electron wave, it collapses into a definite particle, but when we are not looking it keeps its options open. In terms of Born's probabilities, the electron is being forced by our measurement to choose one course of action out of an array of possibilities. There is a certain probability that it could go through one hole, and an equivalent probability that it may go through the other; probability interference produces the diffraction pattern at our detector. When we detect the electron, though, it can only be in one place, and that changes the probability pattern for its future behavior – for that electron, it is

> now certain which hole it went through. But unless someone looks, nature herself does not know which hole the electron is going through.[1236]

This kind of reasoning has led to some of modern science's most preposterous ideas, such as: electrons have a mind of their own and are purposely trying to deceive us; that everything in the subatomic world is a product of chance; that an object only exists when someone looks at it, or that the observer has some telepathic power to make the electron perform on cue. These fantasy-like interpretations are the result of scientists being locked into a paradigm, and that paradigm started when they incorrectly interpreted the Michelson-Morley experiment. Unfortunately, academicians are under the false impression that scientific progress is inevitable; that no grand detours from truth and correct thinking have been made or will be made; that what is done is done and that there is no point in going back and starting all over again. Besides, that would not only be a gut-wrenching embarrassment, but it would put millions of careers and salaries in dire jeopardy. No one is willing to pay that price.

The experiments elicit one obvious conclusion: both parties must admit to a physical and superluminal connection between particles. Apparently, there is an underlying mechanism of cause and effect in nature that has eluded their discovery, at least up until now. There appears to be a whole world of forms and forces to investigate that is far deeper than the threshold available in Quantum Mechanics and the singularities of General Relativity. Current instruments simply cannot probe into this mysterious and infinitesimally small universe, which is the reason theoreticians are forced into hypotheses such as the Heisenberg *Uncertainty Principle*. As Van Flandern notes:

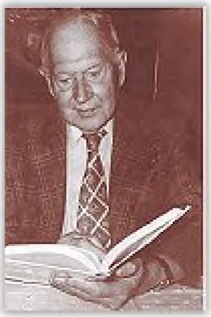
> Of course, nothing about nature requires that the individual agents conveying an action be observably large or otherwise suitable for detection by any human-built apparatus. At one time, single air molecules were unknown to science…. Likewise, the photon…was once unknown, although humankind was able to perceive bulk light long before forming cogent ideas about its true nature."[1237]

Since the infinitesimal dimensions of plancktons defy detection, absolute measurements of their position and velocity will be indeterminable. Once we understand this relationship, the “spookiness” of Quantum Mechanics is minimized. According to *Scientific American*:

[1236] John Gribbin, *In Search of Schrödinger's Cat*, 1984, p. 171.

[1237] "Gravity," in *Pushing Gravity*, p. 93.

> Particles…appear to behave in funky quantum ways simply because we don’t, or can’t, see this underlying order….The equations of quantum mechanics have an uncanny resemblance to those of the kinetic theory of molecules and, more generally, statistical mechanics. In some formulations, Planck’s constant, the basic parameter of quantum theory, plays the mathematical role of temperature. It is as though quantum mechanics describes some kind of gas or ensemble of ‘molecules’ – a chaotic soup of more primitive entities. [1238]



As noted earlier, the density of the plancktons in the universe may be absolutely mind-boggling. **M. A. Markov** of the Academy of Science of the former USSR writes of infinitesimal particles he calls “maximons” possessing a 10^{94} gr/cm^3 density. According to him and many other physicists, this is the fundamental limit of mass density.[1239] V. Krasnoholovets speaks of it even more graphically, using his “cells” and “tessellattice” nomenclature:

> Predictable orders of size…are clusters/universes whose objects range from 1 (the Planck scale, *i.e.* the size of an elementary cell of the tessellattice), to ~10^{10} elementary cells (roughly quark-like size), to about 10^{17} cells (atomic size), to 10^{21} cells (molecular

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[1238] George Musser, “Was Einstein Right?” *Scientific American*, Sept. 2004, p. 89. Musser also quotes Massimo Blasone of the University of Salerno, Italy, stating: “You’d have quantum mechanics as a low-energy limit of some fundamental theory” (*ibid*., p. 90).

[1239] Markov put forward his hypothesis in 1965 (Supplement of the Progress of Theoretical Physics, 1965, p. 85, as cited in “Spontaneous Breaking of Symmetry and Fundamental Mass” by Umida Ibadova, Dept. of Theoretical Physics, Samarkand, Uzbekistan). In a later work, Markov stated “the limiting matter density….is assumed to be a stable particle (maximon) of Planck mass and dimensions” or “a maximon is an elementary black hole of mass $(\hbar c/\kappa)^{\frac{1}{2}}$” where κ is the gravitational constant (“Some Remarks on the Problem of Very Early Universe,” in *The Very Early Universe*, G. W. Gibbons, S. W. Hawking, *et al*., 1983, pp. 353, 361). The value 10^{94} gr/cm^3 was understood as a new universal constant for fundamental mass. Markov also refers to Planck time as 10^{-43}sec and Planck length as 10^{-33}cm.

size), to 10^{28} (human size) to 10^{40} cells (solar system size) up to 10^{56} cells (largest structures).

Speaking of the Planck particles as filling all of space, Krasnoholovets adds:

> This space can be fully associated with the tessellattice of densely packed balls, or superparticles. And this is the degenerate space (one may associate it with an abstract physical vacuum). Superparticles constitute founding cells of the tessellattice and are stacked without any unfilled place between them….Thus, the real space exists in the form of the tessellattice…that densely pack the universe….A particle cannot move without rubbing against superparticles of the tessellattice, and hence a packet of lattice deformations goes forward accompanying the particle. Elementary excitations migrating from cell to cell in fact represent a resistance, *i.e.*, inertia, of the space constructed as the tessellattice…. Furthermore, solutions to the equations of motion show that motion of the particle in the tessellattice is characterized by two de Broglie relationships for the particle: $E = h\nu$ and $\lambda = h/(m\upsilon)$ where $\nu = 1/(2T)$, and these allow the derivation of the Schrödinger equation.[1240]

As noted previously, to understand how dense this really is, one could fit the baryonic mass of approximately 10^{39} universes into a single cubic centimeter. In comparison, we've already noted that only a quadrillionth of the atom is occupied by mass, the rest is "empty space." If this empty space were removed, the atom would be a very dense object. It would be so dense that a teaspoon of it would weigh trillions of tons. Plancktons are even denser, and in fact, they would necessarily constitute the rest of the quadrillion parts of "empty space" between the nucleus and its electrons.

As noted earlier, some have hypothesized fantastic notions that plancktons "pop in and out of existence" from other universes. But any hypothesis of this type inevitably transgresses conservation laws. Every so-called "emission" of a virtual particle amounts to the sudden appearance of additional energy in our universe, while every "absorption" into the adjacent universe amounts to a sudden disappearance of energy from our universe. Thus, we would have violations of the conservation of energy on a grand scale.

[1240] Volodymyr Krasnoholovets, "The Tessellattice of Mother-Space as a Source and Generator of Matter and Physical Laws, in *Einstein and Poincaré: The Physical Vacuum*, 2006, pp. 144, 149-152.

The reality is that plancktons do not "pop in and out" but are here to stay, and, in fact, they provide the best model for understanding the "action-at-a-distance" phenomenon, since their extreme density will allow instantaneous wave-transmission over long distances. Einstein was forced by his own theoretical postulates to limit the speed of gravity to a velocity equal to or less than light, since his mathematics wouldn't let it travel any faster. As Martin Gardner explains it to the novice:

> Imagine a gigantic pair of scissors, the blades as long as from here to the planet Neptune. The scissors begin to close with uniform speed. As this happens, the point where the cutting edges intersect will move toward the points of the scissors with greater and greater velocity. Imagine yourself sitting on the motionless pin that joins the blades. Relative to your inertial frame, the point of intersection of the blades will soon be moving away….Suppose that the handles of the scissors are on Earth and the point of intersection of the blades is at Neptune. As you wiggle the handles slightly, the intersection point jiggles back and forth. Could you not, then, transmit signals almost instantaneously to Neptune? No, because the impulse that moves the blades has to pass from molecule to molecule, and this transmission must be slower than light. There are no absolutely rigid bodies in general relativity.[1241]

So here we have the quintessential distinction between non-ether space and ether space. Since Einstein was forced (so he thought) to dispense with ether because of the Michelson-Morley experiment, there can be no "rigid body" filling in the space between the planets and stars. It is a vacuum, according to Einstein. Consequently, gravity doesn't "travel"; rather, it is created in a certain locale because the mass of a star or planet distorts or 'pulls in' the space around it. Of course the logical question is: what is inherent in "space" that a star or planet can affect it, if space, being a vacuum, is filled with nothing? How can nothing be molded to form a certain shape? The alternative answer is that space is, indeed, filled with something. Not only is it "something," but because its dimensions are in infinitesimally small scales, it fulfills the definition of a "rigid body" and therefore allows for instantaneous transmission of any force between 'Earth and Neptune,' or any body in the universe. It was precisely

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[1241] *Relativity Explosion*, pp. 65-66.

Einstein's misinterpretation of the interferometer experiments, and thus his failure to consider the possibility of a "rigid body," that led him down the wrong path to Relativity. As Einstein wrote in one of his last essays:

> The concept of space was enhanced by the discovery that there exist no completely rigid bodies. All bodies are elastically deformable and alter in volume with change in temperature.[1242]

The Geocentric Connection

What Einstein could not find, the biblical geocentric universe possesses. The "rigid body" is its foundation. The *firmament* of Genesis 1:6-9, by the very definition of the Hebrew word, is "rigid." Its rigidity is necessary to form and maintain anything as large as our universe, and that is precisely why it was created as early as the Second Day. All of the above discoveries of modern science concerning the infinitesimal world of Planck particles and its attending phenomena can be synthesized into an ingenious and fascinating model of geocentrism. In fact, this model shows that the Planck dimensions of physics not only constitute the fundamental fabric of space, they are the ingredients essential to make a universe function. **Gerardus Bouw**, probably the premier geocentric scientist today, has engineered such a model. Basically Bouw argues that the "fundamental constants" of physics (*e.g.*, gravity, electric charges, position, time, temperature, entropy) can only be joined together in a limited number of ways in order that no one constant conflicts with the others. Since there is a plurality of fundamental constants, a least common denominator is needed to join them all together. The melding of these constants is accomplished in two ways: on the one hand, at the extreme ends of the physical spectrum, by reducing the mixing crucible to scales much smaller than atomic particles so that all the necessary constants are represented in their irreducible form; and, on the other hand, to test how these constants react in sizes as big as the universe, which, of course, is the ultimate large scale environment. The most crucial constants that need to be joined together are: Planck's constant, Boltzmann's constant, the speed of light, and the gravitational constant.[1243] As Bouw puts it:

[1242] Albert Einstein, "Relativity and the Problem of Space," cited in Albert Einstein, *Ideas and Opinions*, 1954, p. 365.

> As we proceed to smaller and smaller scales nothing interesting seems to be happening until we get to a scale of about 10^{-33} cm. At that size called a *Planck length*, fascinating things happen…we find that the warp and woof of heaven comes into focus. Physics attempts to derive relationships between the different properties of objects. Such relationships typically involve certain constants: values which are generally assumed not to change over time. The speed of light is such a constant. So is the gravitational constant. It turns out that there are relationships among these constants themselves, and those relationships all express themselves to specifics at the Planck length. For example, the Planck length itself, *L*, relates Planck's constant (a unit of angular momentum or spin energy), *h*, the speed of light *c*, and the gravitational constant *G* to give a length of 1.616×10^{-33} cm.[1244]
>
> Modern science is not certain as to the meaning of these numbers, but the most popular explanation at present is that they signify particles which pop into existence, exist for about 10^{-44} seconds, and then pop out of existence again. These particles, called Planck particles, form the basis for various cosmological theories such as strings, superstrings, 10-dimensional space, and so on.[1245] So it seems that we are engulfed in a sea of Planck

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[1243] We hasten to add, however, that the gravitational constant has shown some inconsistency over the years. In 1986, for example, the value assigned to *G* was $6.67259 \pm 0.00085 \times 10^{-11}$, while in 1998 it was given a value of $6.673 \pm 0.010 \times 10^{-11}$, a factor of ten in just twelve years (Pari Spolter, "Problems with the Gravitational Constant," *Infinite Energy*, 10:39, no. 59, 2005).

[1244] Gerardus D. Bouw, *Geocentricity*, Association for Biblical Astronomy, Cleveland, OH, pp. 324-325. Bouw continues: "By the same token, the constants give us a fundamental unit of mass *M*, called the *Planck Mass*, which is 2.177×10^{-5} gm. The corresponding basic unit of time, the *Planck time*, *t*, is 5.391×10^{-44} sec. [NB: The *Planck length* is the distance light travels (10^{-33} cm) in one Planck time interval (10^{-44} sec)]. Lastly, the fundamental unit of temperature *T* can be derived by introducing Boltzman's constant, *k*, and it gives a temperature for the firmament of 1.417×10^{32} °K; a most fervent heat not observed anywhere in the universe."

[1245] Bouw, *Geocentricity*, p. 325. In Superstring theory the "strings" have dimensions as those in the Planck world. The "strings" are said to have a length of 10^{-33} cm and a mass of 10^{-6} g. Rather than calling them "Planck particles," String

> particles. The particles can be viewed as constituting a pervasive medium which acts like an ideal fluid (meaning that there is no friction). The density, P, of that fluid is an astounding 3.6×10^{93} g/cm^3…If this doesn't qualify for the name "firmament," then what does?[1246]

A substance of such a high density as the firmament has some interesting properties. One would think, for example, that it would be impossible to move in such a medium, just as one could not move if encased in iron. Normally this is true, but the deBroglie wavelengths of nuclear particles are so long compared to that of the Planck particles that the firmament is transparent to them. This is similar to why light can travel through a "dense" medium such as glass instead of being stopped cold on impact. Bouw concludes:

> The advantage of the firmamental model is that it can easily account for a number of experimental observations which are harder to explain heliocentrically. These include the Sagnac effect, Faraday disk-generator paradox, Earth's night-time

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theorists have designated them as "strings" in order to provide a mental picture of their function. For example, a closed string produces gravity, hence the popular theory known as "Quantum Loop Gravity." Mathematically, String theory has succeeded in uniting all known particles, including the Higgs boson and fermions, within one spatial superstructure, yet this superstructure must possess 10 or more dimensions in order to do so. An even more accommodating concept is Massive Superstring theory, which is the closest modern science seems to have come in understanding the universe's underlying superstructure. In this theory, the string takes on the complete Planck dimensions of time (10^{-44} sec), length (10^{-33} cm), temperature (10^{32} K) and mass (10^{-5} gm).

[1246] *Geocentricity*, p. 326. Bouw is referring to the "firmament" mentioned in Genesis 1:6-9, 14-20 as filling the entire space between the Earth's surface and the edge of the universe, and into which the stars and other heavenly bodies are placed. To understand the tremendous density of the Planck "firmament," Bouw adds: "Let us try to envision such a cube made up of Planck particles. The numbers are incomprehensible. For example, the mass of the entire universe is estimated to be about 2×10^{54} g. Packing everything in the universe into the cube would only give us a density of 2×10^{54} g/cm^3, far short of the Planck medium's 3.6×10^{93} g/cm^3. That means that one would have to pack 2×10^{39} universes into the cube to arrive at the appropriate density!" (*ibid.*). In this way, it can be said that the Planck particles are so small that it is as if to us they do not exist, and thus movement through them is as natural as walking through air. For the biblical support of the firmament being composed of such a super dense material substance, see Chapter 12, Volume II of this book under Job 37:18.

> electric field, and ball lightning. And so both heliocentrically-based quantum mechanics and geocentrically-based firmamental mechanics explain the same phenomena at the Planck scale, albeit with different philosophical assumptions: one assumes that space is filled, the other that space is empty.[1247]

As Markov has suggested, these infinitesimal particles would also act as a frictionless fluid. As Martin Selbrede notes:

> Markov poses that the Planck particles behave like sub-microscopic black holes. He is basically describing the property of this material. If you create a liquid out of maximons, how does it behave? He says it really behaves like space. In other words, you can move through it freely. So the objection again that this ultra-rigid ether or plenum – whatever words you want to use; firmament has been proposed as a term for it – that you can't move though it, because I can't move through lead and I certainly can't move through something that is a hundred thousand times thicker than lead, Markov says that is not true. There is nothing heavier than a black hole, assuming you believe in them in the first place, and consequently a liquid made of these microscopic black holes behaves like a space does. It behaves a lot like what we would call a space-time quantum foam. It is quasi-isotropic, which means it behaves generally the same in all directions. I would put some qualification on it, but it means that in the literature, again, you see all the foundational pieces of the geocentric model are there, either overtly or covertly present.[1248]

Someone might argue, however, that if plancktons are particles with spherical shape, what constitutes the space between the spheres? Is there an even smaller particle? The answer to this may be that at a 10^{-33}cm diameter mass has reached a point where individual units of mass are no longer spherical. In other words, the unit of mass is so small that it has reached the point in which there is no more space between the individual particles. This state, of course, is hard for us to imagine, but if we begin, for example, with a jar of marbles and pour water into the jar, the water will take up the remaining space left by the ajoining marbles. If we imagine the marbles getting smaller and smaller yet increasing in number to fill respective jars, less and less water will be required to fill in the empty space. If we keep reduce the size of the marbles we will eventually reach a point in which there is no more space for the water to fill. This is the point at which matter has reached its ultimate density and it can go no further and still remain mass. This is the state of supergranularity and this is what gives the plancktons their absolute rigidity yet, at the same time, the supergranularity gives the plancktons their absolute flexibility so that no friction occurs between it and atomic matter that is twenty orders of magnitude larger.

[1247] Gerardus Bouw, *Bulletin of the Tychonian Society*, No. 46, 1988, p. 33.

[1248] Interview of Martin Selbrede for the scientific documentary, *The Principle*, produced by Stellar Motion Pictures, LLC, Los Angeles, California, 2012. Selbrede notes that "A maximon is not necessarily a black hole, according to Markov, but 'may be a particle of the same Planck dimensions, but with a structure essentially different from a black hole. Their gravitational radius coincides with their Compton length,' *ibid*, pg. 365. This is pointed out here to cut short any critique that the firmament model clearly leans on general relativity by relying on the existence of microscopic black holes" ("Rebuttal of North and Nieto," by Martin Selbrede, 1994, Chalcedon Foundation).

To get an idea of how small a planckton is, we can start by imagining a drop of water being as big as the earth. At that size, an electron would be the size of a softball. Now, imagine the electron to be the size of the earth. At that size, the planckton would be the size of a softball. Eventually, we reach a point where the matter cannot be broken down any farther and still remain matter. It would constitute a physical law of nature. That point is 10^{-33}cm.

Because of the flexibility of the plancktons, objects from the size of electrons to those of giant superclusters of stars can move through them with no resistance, and they will move as all matter does – by wave motion. This is precisely why quantum mechanics finds that the proton, neutron and electron are wave/particle dualities. The wave dimension of matter is needed to move through the dense Planck medium, while the particle nature moves through the vacuum of space (*e.g.*, a planet revolving around the sun moves through the vacuum of space). The leading wave of matter moving through the ether is the essence of the de Broglie wave. As light can move through a solid block of transparent material, analogously, solid objects can move through the plancktons that permeate the universe. Great pressure does not necessarily inhibit movement or cause friction, but will actually help an object to move, since the pressure helps eliminate molecular action against the moving body and allows energy losses only through turbulence and wave action, provided the pressure is equally distributed. We see this in everyday life, for example, when a submarine experiences less drag and can move more freely the deeper it is submerged into the ocean. In the laboratory, it has been shown that super-cooled helium allows motion of objects through it without any detectable friction. This substance acts so peculiarly at 0.25 degrees above absolute zero that it is understood as a "new phase of matter, a 'supersolid' form of helium-4 with the extraordinary frictionless-flow properties of a superfluid."[1249] As Robert Laughlin notes:

> The similarities between the vacuum of space and low-temperature phases of matter are legendary in physics. Not only are phases static, uniform quantum states, but their most subtle internal motions are physically indistinguishable from elementary particles very generally. This is one of the most astonishing facts in science, and something students always find upsetting and difficult to believe. But they eventually become convinced after looking at enough experiments, for the evidence is plentiful and consistent. In fact, the more one studies the mathematical descriptions of cold phases, the more accustomed one gets to using the parallel terminologies of matter and space interchangeably. Thus instead of a phase of matter we speak of a vacuum. Instead of particles we speak of excitations. Instead of collective motions we speak of quasiparticles. The prefix "quasi" turns out to be a vestige of the historical battles over the physical meaning of these objects and conveys no meaning. In private conversations one drops the pretense and refers to the objects as particles.[1250]

[1249] Barbara Kennedy, "Strong New Evidence of a New, Supersolid Phase of Matter," *Science Journal*, Penn State University, Summer 2005, p. 8. Kennedy continues: "Solid helium-4 appears to behave like a superfluid when it is so cold that the laws of quantum mechanics govern its behavior…. 'We used to think that a solid could not flow, but now we have discovered that when you cool solid helium to a sufficiently low temperature it can not only flow, but it actually flows without friction….The implication of our research is that we now have to rethink what we mean by a solid'" (*ibid*., p. 9). Additionally, at 2.2 Kelvin the helium will have no viscous drag with its rotating container; at certain speeds it will spin twice as fast as its container; and it will mysteriously penetrate through its container. Mercury has been found to have zero resistance to electrical current at 4.1 Kelvin. Sodium atoms at 435×10^{-9} Kelvin stopped the travel of light for a few milliseconds. The discovery of these reactions is based in part on the Planck, Einstein and Bose theory of heat capacity. It theorizes that near 0° Kelvin, atoms may group together under the same wavefunction to act as a single 'superatom' and is known as a Bose-Einstein condensate. See *Einstein's Other Theory: The Planck-Bose-Einstein Theory of Heat Capacity*, Donald W. Rogers, 2005, pp. 165-175.

[1250] Robert B. Laughlin, *A Different Universe*, p. 105.

One can imagine what the extent of frictionless qualities would be for a super-fluid at 10^{93} g/cm^3. As Bouw views it:

> The firmament is like a huge solid block, somewhat analogous to a crystal. At the same time, its granularity is so superfine that it also behaves like a superfluid…All solids are fluid to some extent…Any grouping of lattice frames (such as would constitute a photon, neutrino, proton, atom, molecule, star, galaxy or universe) is not attached to any fixed (determined) position in the firmament's matrix and so can – indeed, must – move, rotate, or both move and rotate relative to the firmament. As such, the entire lattice, which is the stellar universe, can be treated as an entity independent of the firmament.[1251]

As Bouw describes it in modern terms:

> In short, this means that the firmament is an underlying medium. The atoms and galaxies of our universe are merely tiny, insignificant disturbances in the firmament. Because of the Heisenberg Uncertainty Principle matter is totally unaware of the firmament's existence. If it were not for Scripture, we would be equally unaware of it. Only on extremely small scales, distances of the order of a Planck length, does the firmament show through the warp and woof of space….The firmament which God created on the second day is thus an extremely massive structure. Its properties are manifold and in a very literal sense, it determines the very physics of the universe….From the perspective of modern science, the firmament…is a very viable scientific option. It is a super-dense, created medium which mimics a plenum. It does so by both keeping absolute position and time

---

[1251] Gerardus Bouw, *Bulletin of the Tychonian Society*, No. 47, 1988, p. 13. Bouw also notes that Nobel laureate, Steven Weinberg has a similar view for modern physics. Weinberg estimates the energy density of the universal medium to be 10^{113} GeV, which equals a mass density of 10^{89} g/cm^3, which is only four orders of magnitude less than Bouw's estimate (Steven Weinberg, *Reviews of Modern Physics*, January, 1989, as cited in *Bulletin of the Tychonian Society*, No. 53, p. 34). Bouw adds that the firmament is larger than the universe, and it is the universe that is expanding, not the firmament. The firmament would thus have to be larger in radius than the universe, equal to the amount of time the universe has and will expand. In biblical proportions this would equal approximately 10,000 light-years or less. The "independence" of the firmament from the universe is the reason for the Heisenberg Uncertainty Principle.

> indeterminate within it (Heisenberg Uncertainty Principle), as well as allowing only wave motions and disallowing absolutely straight line motion….It reacts instantly to any changes within it (in about 10^{-78} seconds). Material objects can only become vaguely aware of its existence on extremely large scales (of the order of the size of the universe) and on extremely small scales (of the order of sub-nuclear particles). *None of these phenomena are new, all have been noted before in the scientific literature.*[1252]

Noted above is a reference to the reaction time within the firmament. Expanding on this concept, Bouw presents an ingenious system that demonstrate the speeds at which waves traverse the universe. Each calculation follows the known laws of physics. The first calculation is the speed of sound as a function of tension (*T*), otherwise known as "transverse waves," which is how light beams travel through space. The equation for a transverse wave is: v_{t} = $\overline{\text{¥6}}$ äwhere is the mass per unit length. In the Planck dimensions, the mass of the firmament is 2.2 × 10^{-5} grams over a length of 1.6 × 10^{-33} centimeters, yielding a value for at 1.89 × 10^{56} gm/cm. Since the tension is the gravitational attraction between plancktons, the force is: $T = G\ ^2$ = 1.27 × 10^{49}. Substituting these values in the original formula [v_{t} = $\overline{\text{¥6}}$ ä] yields v_{t} = 3.04 × 10^{10} cm/sec (within the margin of error for the speed of light), and thus, as Bouw concludes: "the transverse-wave speed of a disturbance in the firmament is the observed speed of light."[1253]

A second calculation of speed can be based on temperature. In Planck dimensions, the firmament has a temperature of 1.42 × 10^{32} Kelvin. The quantum speed, v_{q}, is related to Boltzmann's constant, *k*, while the particle mass, *m*, in the equation: v_{q} = $\overline{\text{¥: u G 6TF s}}$yields a value for v_{q} as 5.17 × 10^{10} cm/sec.[1254]

The third calculation is the most significant since it measures the speed of the pressure wave (compressional or longitudinal) through the firmament. This calculation depends on the compressibility of the universe in the firmament. The speed of the pressure wave, v_{b}, is derived by its relation to the density, !, in the equation: v_{b} = ¾(B_{m}/ !). A bulk modulus relates pressure to volume by the formula $B_m = (P - P_o)\ V_o/V_o - V$, where P and V are the compressed pressure and volume and P_o and V_o are the original values. Assuming a difference in compression between space and the firmament, $P_o = 0$ while $P = 10^{49}$ (the pressure between two plancktons). $V_o = 10^{85}$ cm^3, the volume of the universe. The final volume is 10^{-39} cm^3. The density is the critical density of the universe set at 10^{-29} gm/cm^3. Applying these estimates in the formula: $v_b =$ ¾(B_m/ !), then $v_b = 3 \times 10^{39}$ cm/sec as the speed of the compression waves. At this rapid speed the compression wave crosses the universe in 10^{-11} seconds, virtually instantaneously. Depending on adjustments to the above figures, the upper limit for the speed of the compression wave is the Planck time of 10^{-44} seconds as opposed to 10^{-11} seconds.[1255]

[1252] *Geocentricity*, p. 329, emphasis added.

[1253] Gerardus Bouw, *The Biblical Astronomer*, vol. 12, no. 99, 2002, pp. 17-18.

[1254] In this case Bouw notes: "This is roughly twice the speed of light and may well be equal to the speed of light given that the coefficient of 3 assumes three degrees of freedom for the particle. If there's only one, then the speed becomes 2.98 x 10^{10} cm/sec which is the speed of light" (*ibid.*, 18).

Finally, whatever we will discover in the future regarding the balance between the Planck world, the electropon net, electromagnetic radiation, the Cosmic Microwave Background radiation,[1256] long wavelength photons,[1257] or the neutrino sea, the point is made that there are many viable ingredients as to the constituents of ether, as well as understanding why Michelson-Morley and every other interferometer experiment for the next 50 years all measured a resistance to the ether. Since, as these experiments indicate, Earth is motionless at the center of a universe filled with infinitesimally small particles that are revolving around it, we would expect only a slight resistance to register in the interferometers located at the Earth's surface. It is a fact of science that we did, indeed, obtain that slight resistance, and which resistance has heretofore been dismissed by modern science. In fact, the wave/particle duality of light, the mysterious results of the "double-slit" experiment, the de Broglie wave or the Schrödinger wave, may be nothing more than the effect of particles (*e.g.*, photons, electrons, etc.) reacting to the infinitesimal medium through which they travel. A particulate medium many times smaller than atomic particles and photons must be very dense, and thus it can allow movement only through wave motion. Thus, any particle moving through the medium, including photons, will create waves proportional to the speed that the entity is able to travel through the medium. The undulation of the wave itself, however, can travel at superluminal speeds, due to the extreme density of its substance. In this way, the issue of "causality" is undisturbed, since there is direct contact between physical entities that will cause eventualities.

[1255] *Ibid.*, p. 19. Bouw is using a formula common in physics. C. L. Andrews writes: "For longitudinal waves in a liquid v = ¾B/ ! where B is the bulk modulus of elasticity and ρ is the mass per volume or 'volume density'…For transverse waves in a solid v = ¾n/ ! where n is the shear modulus of elasticity and ! the density. By definition of a solid, only solid media may transmit transverse waves. Thus the historical 'ether' is a solid which, if it has a shear modulus of elasticity no less than steel, must have a density less less than that of our best vacuum in order to transmit transverse waves with the speed of light" (*Optics of the Electromagnetic Spectrum*, 1960, p. 53).

[1256] "Induction of Gravitation in Moving Bodies," Matthew R. Edwards in *Pushing Gravity*, p. 139; "Action-at-a-Distance and Local Action in Gravitation," Toivo Jaakkola in *Pushing Gravity*, p. 158.

[1257] "Gravitation as a Compton Effect Redshift" John Kierien, *Pushing Gravity*, pp. 131-132

The Center of Mass for the Firmament and Earth

Bouw also gives us the unique relation between the Planck firmament and the Earth in regards to the center of mass of both. He writes:

> Moreover, because the firmament is some 10^{123} times as massive as the universe, the universe follows the firmament-induced Coriolis and Centrifugal forces' dictates….Since the earth is located at the gravitational center of the firmament and on its axis of rotation, it will not feel the gravitational wave….There is one other phenomenon predicted by this model. If the earth is at the gravitational center of the firmament, earth's gravitational field, as opposed to any other body's gravitational field, coincides with the firmament's. As such, any force applied to either move the earth out of its central position or to change the length of the day, will be opposed by the firmament, which will perceive said imposed force as an attempt to change its position or rotation rate. By Newton's first law—for every action there is an equal and opposite reaction—the responding force, coming from an immovable object, will transfer the action of the force onto the universe….the universe does the moving in the opposite direction of what the earth would have moved had it not been at the core of the firmament's gravitational field.

Bouw then shows the connection of the dual center of mass with the orientation of the Cosmic Microwave Background Radiation (CMB):

> It is, therefore, a small wonder that the three poles [dipole, quadrupole and octupole of the CMB] should line up with the ecliptic. The Axis of Evil may be dismissed as an unfortunate coincidence and the quadrupole and octupole may be regarded as 'local' (although no realistic explanation has yet surfaced), but

the fact remains that these follow logically from all experimentally-based, geocentric results.

The evidence suggests that the cosmic phenomena that reveals the Axis of Evil are a consequence of the yearly Coriolis force exerted by the effective daily rotation of the firmament. We examined the effect of that rotation on the sun from a geocentric perspective—that the entire universe will follow the solar motion as long as the center of gravity of the earth exactly coincides with the center of gravity of the firmament.[1258]

[1258] *The Biblical Astronomer*, Vol. 21, No. 137, pp. 73-74.

Galileo Was Wrong
The Church Was Right

The Evidence from Modern Science

Volume II

Chapters 7 to 13

Seventh edition

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and
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This volume is dedicated to

Stephen Hawking

….who had the courage to admit that the scientific
evidence indicates the Earth is in the center of the
universe, but chose not to adopt it because he wished
for men and women to be modest
and not think they are special

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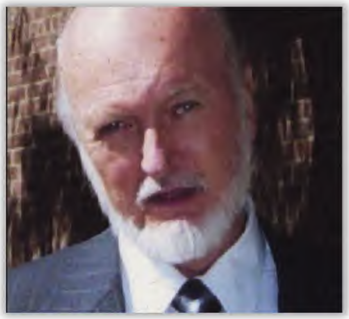

Robert J. Bennett, Ph.D., holds a doctorate in Physics from Stevens Institute of Technology with a thesis on General Relativity titled "Relativistic Rigid Body Motion." He served as a physics instructor at Manhattan College and Bergen Community College from 1967-1983, and is presently doing private tutoring in physics and mathematics. Dr. Bennett has written Chapter 10, a detailed, technical and mathematical explanation of the various arguments for Geocentrism. He has served as a consultant for the entire *Galileo Was Wrong: The Church Was Right* project.

"There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact."

Mark Twain[1]

"A scientific theory neither explains nor describes the world; it is nothing but an instrument."

Karl Popper[2]

"I think that we shall have to get accustomed to the idea that we must not look upon science as a 'body of knowledge,' but rather as a system of hypotheses, or as a system of guesses or anticipations that in principle cannot be justified, but with which we work as long as they stand up to tests, and of which we are never justified in saying that we know they are 'true' or 'more or less certain' or even 'probable.'"

Karl Popper[3]

"It is really quite amazing by what margins competent but conservative scientists and engineers can miss the mark, when they start with the preconceived idea that what they are investigating is impossible. When this happens, the most well-informed men become blinded by their prejudices and are unable to see what lies directly ahead of them."

Arthur C. Clarke[4]

"Physics is much too difficult for physicists."

David Herbert[5]

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[1] *Life on the Mississippi*, Signet Classics, 2001, p. 106.

[2] *Conjectures and Refutations: The Growth of Scientific Knowledge*, p. 102.

[3] *The Logic of Scientific Discovery*, 1935, reprint 2002, p. 318.

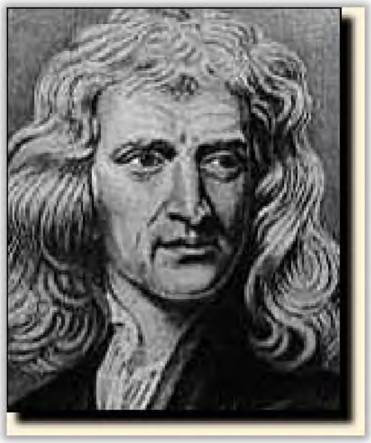
[4] Arthur C. Clarke, *Profiles of the Future: An Inquiry into the Limits of the Possible*, 1963, 1984, pp. 21-22. Clarke is also the author of *2001: A Space Odyssey*.

[5] As cited in *Hilbert* by Constance Reid, 1907, p. 127. Hilbert helped develop the theory of Relativity.

Chapter 7

The Cause of Gravity in the Geocentric Universe

One might think that for all the scientific knowledge man possesses, he would have discovered by now what causes one of the simplest and most common phenomena in the world – gravity. The reality is, however, that modern science is completely baffled about the nature of gravity. René Descartes claimed that the entire universal machine was directed by "ether eddies," which were said to cause the planets to revolve in continual circular motion. **Isaac Newton** didn't much care for the Frenchman's theory, preferring to demonstrate gravity as a mere mathematical phenomenon. Most people have been led to believe that Newton "discovered" gravity while sitting under an apple tree whereupon an apple falls on his head and Newton suddenly jumps to his feet realizing that some kind of force must have made the apple move downward. In reality, this story was an invention of Newton's so as to give himself priority over his peers in the discovery of gravity.[6] Whatever Newton's motivations, the question remaining for him and the rest of modern science concerned what "force" was making the apple move. Was this a force inherent in matter itself that caused it to be attracted by other matter? Or was something pushing or pulling the apple toward the Earth?



Although he speculated, Newton didn't know the cause of gravity. The only thing he could do is measure, within a respectable margin of error, the rate at which the apple, with its particular mass, fell to the Earth. Oft quoted from Newton is his letter to Bentley stating that he did not believe gravity was intrinsic to matter itself:

---

[6] I. Bernard Cohen writes: "Newton also circulated the familiar story that a falling apple set him on a chain of reflections that led to the discovery of universal gravitation. Presumably this invention was also part of his campaign to push back the discovery of gravity, or at least the roots of the discovery, to a time 20 years before the *Principia*" ("Newton's Discovery of Gravity," *Scientific American*, 244 (3), 166, 1981).

> It is inconceivable that inanimate brute matter should, without the mediation of something else which is not material, operate upon and affect the matter without mutual contact; as it must do if gravitation, in the sense of Epicurus, be essential and inherent in it. And this is the reason why I desired you would not ascribe innate gravity to me. That gravity should be innate, inherent and essential to matter, so that one body may act upon another at a distance through a vacuum, without mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity that I believe no man who has in philosophical matters a competent faculty of thinking can ever fall into it. Gravity must be caused by an agent acting constantly according to certain laws; but whether the agent be material or immaterial I have left to the consideration of my readers.[7]

The truth is that Newton wavered back and forth on whether gravity had a physical cause, and offered one of the first theories of its mechanical origin. His original theory incorporated the concept of a universal ether, which gave explanations for light, electric, magnetic, and gravitational forces. The ether that caused gravity was said to be tenacious and elastic in nature, condensing on objects as it descended from above. As Newton explains (in his original spelling):

> In which descent it may beare downe with it the bodyes it pervades with force proportionall to the superficies of all their parts it acts upon; nature makeing a circulation by the slow ascent of as much matter out of the bowels of the Earth in an aereall forme which for a time constitutes the Atmosphere, but being continually boyed up by the new Air…riseing underneath, at length…vanishes againe into the ethereall Spaces…and is attenuated into its first principle.[8]

---

[7] Third Letter to Bentley, February 25, 1693, Newton's Correspondence, registered in the Royal Society in 1675, *Correspondence*, vol. 3, p. 253.

[8] Letter to Halley, June 20, 1686, in reference to Newton's paper "An Hypothesis Explaining the Properties of Light," registered in the Royal Society in 1675, *Correspondence*, p. 366; cited in *Annals of Science*, 25, 25-260, (1969), cited by

As to the origin of his inverse-square law, Newton held that it was ether (aka "spirit") that determined this mathematical formula:

> …that the descending spirit [ether] acts upon bodies here on the superficies of the Earth with force proportional to the superficies of their parts, which cannot be unless the diminution of its velocity in acting upon the first parts of any body it meets will be recompensed by the increase of its density arising from that retardation….Now if this spirit [ether] descend from above with uniform velocity, its density and consequently its force will be reciprocally proportional to the square of its distance from the center. But if it descend with accelerated motion, its density will every where diminish as much as its velocity increases, and so its force (according to the Hypothesis) will be the same as before, that is, still reciprocally as the square of its distance from the center.[9]

Four years later, Newton replaced the ether-stream idea by another hypothesis that postulated the increase in size of the particles with their distance from the center of the Earth. The larger particles would not fill in the pores of material bodies, which would leave room for the smaller particles to do so, and in turn displace the body downward.[10] Newton, however, wavered on a mechanical cause for gravity, at times attributing its cause to God's omnipresence, and later Fatio de Duillier writes of him:

> The plain truth is that he believes God to be omnipresent in the literal sense….He believes they [the Ancients] reckoned God the cause of it, nothing else, that is no body being the cause, since every body is heavy."[11]

In 1686, in a letter to Halley, Newton wrote of his inverse square law: "...but downwards that proportion does not hold," which he attributed to a reduction of the ether stream in the interior of the Earth by condensation.[12] In the second edition of the *Principia* in 1713, Newton stated that the force of gravity "operates not according to the quantity of the surfaces of the

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E. J. Aiton in "Newton's Ether-Stream Hypothesis and the Inverse Square Law of Gravitation" *Pushing Gravity*, p. 61.

[9] *Ibid*., Letter to Halley, *Correspondence*, p. 447.

[10] *Ibid*., *Correspondence*, p. 295.

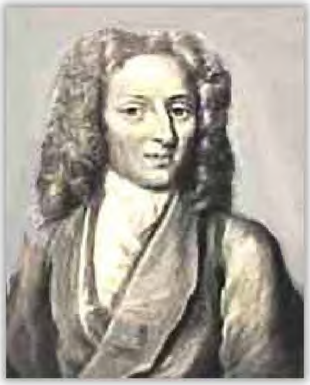
[11] "Gravity in the Century of Light" in *Pushing Gravity*, *Ibid*., p. 14. "Fatio on the Cause of Universal Gravitation," pp. 56, 61.

[12] "Newton's Ether-Stream Hypothesis and the Inverse Square Law of Gravitation" *Pushing Gravity*, p. 61.

particles upon which it acts, but according to the quantity of the solid matter which they contain."[13] In the 1717 second edition of his *Opticks*, however, Newton suggested an alternate mechanical cause for gravitation, supposing that the density of the ether increased with the distance from the Earth, so that the elastic force of the ether impelled bodies towards the less dense parts.[14] E. J. Aiton sums up Newton's view:

> Although, as Newton admitted, the hypothesis was "one of my guesses which I did not rely on," his argument rested on the premise that, in its implications, the hypothesis reliably reflected his exact scientific views. As interpreted by Newton himself, the ether-stream hypothesis implies the inverse square law in free space, whether the velocity of the ether-stream is constant or accelerated.[15]

The Theories of De Duillier and Le Sage



In 1690, **Nicolas Fatio de Duillier**, a Swiss mathematician who, some say, had an intimate relationship with Newton,[16] presented an explanation of universal gravitation, of which Newton approved, to the Royal Society. Initially, Fatio sought to reconcile Newton's mathematical computations with Huygens' physical medium for gravity, thus introducing the concept of infinitesimally small particles traveling through or interacting with porous material bodies. Newton favored Fatio's theory, stating:

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[13] *Mathematical Principles of Natural Philosophy*, 1962, p. 546, Frans van Lunteren, "Fatio and the Cause for Universal Gravitation," *Pushing Gravity*, p. 56.

[14] Isaac Newton, *Opticks*, Dover Publications, 1952, Query 21, cited by van Lunteren, p. 62. Oliver Lodge notes: "First of all, Newton recognized the need of a medium for explaining gravitation. In his "Optical Queries" he shows that if the pressure of this medium is less in the neighbourhood of dense bodies than at great distances from them, dense bodies will be driven toward each other; and that if the diminution of pressure is inversely as the distance from the dense body, the law of force will be the inverse square law of gravitation" (*The Ether of Space*, p. 111).

[15] "Newton's Ether-Stream Hypothesis," in *Pushing Gravity*, p. 64.

[16] F. Manuel, *A Portrait of Isaac Newton*, Cambridge, MA, 1968, pp. 191-212.

> And these are the necessary conditions of an hypothesis by which gravity is to be explained mechanically. The unique hypothesis by which gravity can be explained is however of this kind, and was first devised by the most ingenious geometer Mr. N. Fatio.[17]

Georges-Louis Le Sage was introduced to Fatio's theory through Gabriel Cramer in 1749, Fatio having died in 1753. Le Sage referred to the mechanical substance undergirding gravity as "ultramundane corpuscles," from his belief that God launched the corpuscles into motion at the beginning of creation from reaches outside the known universe, and thus they were "ultramundane."[18] James Evans adds:

> Le Sage deduces the inverse-square law…a small spherical region of space, traversed by a current of ultramundane corpuscles traveling in all directions. The number of corpuscles that cross a unit of area on the surface of this small sphere will be spread out over a correspondingly larger area on the surface of a larger surrounding sphere, in such a fashion that the number crossing through a unit area will fall off as the inverse square of the distance…in Le Sage's system, apparently solid objects must be made mostly of empty space. In his *Mechanical Physics*, Le Sage speculated that the atoms of ordinary matter are like

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[17] *Principia*, Book III, cited in "The Unpublished Scientific Papers of Isaac Newton," A. R. Hall and M. Boas Hall, eds., Cambridge, MA, 1962, p. 315, cited by Frans van Lunteren in "Fatio on the Cause of Universal Gravitation," in *Pushing Gravity*, p. 55.

[18] Evans, "Gravity in the Century of Light," *Pushing Gravity*, p. 25.

> 'cages,' that is, they take up lots of space, but are mostly empty. In this way, ordinary objects block only a tiny fraction of the ultramundane corpuscles that are incident upon them.[19]

Le Sage's theory was largely rejected, mainly because of the objections of James Clerk Maxwell, although no one else, including Maxwell, offered an alternative model for the cause of gravity. Maxwell had rejected it mainly on thermodynamic grounds, claiming that the transfer of high kinetic energy from the corpuscles to a material object would incinerate the latter.[20]

Pierre-Simon Laplace (d. 1827), although never committing to Le Sage's theory, nevertheless concluded:

> …if one absolutely wants a mechanical cause of weight, it appears to me difficult to imagine one which explains it more happily than the hypothesis of M. Sage…[21]

Henri Poincaré had also rejected Le Sage's theory on the same basis as Maxwell, claiming that it would require the corpuscles to travel at 10^{24} faster than light, which would incinerate the material objects it touched. Le Sage had countered that his corpuscles would only have to move at 10^{13} faster than light.[22] To account for the objection from Poincaré, modifications to Le Sage's model were introduced by Kelvin and Preston. Kelvin (William Thomson) had established the kinetic theory of gases in 1873, and developed the idea that Le Sage's corpuscles behaved as gases, suggesting that the excess energy be dissipated by vibration and rotation of the corpuscles.[23] Maxwell and Poincaré then took a second look at the theory, especially in regard to the effects of gravitational shielding during eclipses, which also interested **Quirino Majorana** and Albert Michelson.[24]

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[19] *Ibid.*, pp. 25, 31.

[20] Maxwell published his review in the Ninth Edition of the *Encyclopedia Britannica* under the title "Atom," in 1875. Maxwell used the formula $p = Nmu^2$, where p is the pressure of the corpuscles, m the mass of the corpuscle, N the number of corpuscles, and u the velocity of the same.

[21] Laplace to J. –A. Deluc, October 1781, in Le Sage papers, Geneva, BPU; Ms. Suppl. 513, f. 260, cited by Evans, p. 31.

[22] James Evans, "Gravity in the Century of Light," in *Pushing Gravity*, p. 24.

[23] "Le Sage's Theory of Gravity: The Revival by Kelvin," Matthew R. Edwards in *Pushing Gravity*, pp. 68-71.

[24] Majorana found that placing a lead mass between a lead sphere and the Earth reduced the gravitational pull on the sphere, although very slightly, whereas

In 1877 Preston showed that Maxwell's mathematical formula was unbalanced. Maxwell died two years after Preston's paper, and thus his final thoughts are not known. In 1881, however, Kelvin retracted his support of Le Sage's theory based on its seeming inability to explain the perfect isotropy of gravity. Still, Lorentz in 1900 and Brush in 1911 attempted to revive Le Sage's theory by substituting electromagnetic waves for corpuscles. Assuming space is filled with radiation, Lorentz showed that charged particles would attract each other, but only if the incident energy were completely absorbed, which brought back the possibility of incineration. After this, Le Sage's theory had few adherents, especially since General Relativity dispensed altogether with a corpuscular theory of gravity, even though, as we noted earlier, Einstein still maintained the concept of "physical" ether defined by spacetime tensors.[25]

The Problems with General Relativity's Concept of Gravity

Einstein's postulate that nothing can go faster than the speed of light causes severe problems for current cosmology's concept of gravity, for gravity must then travel at the same speed, or a speed less than that of

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placing the lead mass above the sphere did not alter the pull. Majorana concluded that this contradicted Le Sage's theory of gravity, but it is also inconsistent with Newton's theory, since it does not account for gravitational shielding. Others hold that there is no clear distinction between Majorana's and Le Sage's views, even in principle; still others have found little or no results from gravitational shielding.

[25] Others who continued the Le Sage models appeared in the second half of the twentieth century: Radzievskii and Kagalnikova (1960); Shneiderov (1961); Buonomano and Engel (1976); Adamut (1976, 1982); Veselov (1981); Jaskkola (1996); and Van Flandern (1999).

light. But a gravitational force that is limited to the speed of light will cause enormous problems for the vast distances it must travel in the universe. For example, considering that the distance between the sun and Earth is 143 million kilometers, light from the sun takes 8.5 minutes to reach Earth. We on Earth don't notice this travel time because light is continually being discharged from the sun, but if the sun were to stop shinning, we wouldn't notice the absence of light until 8.5 minutes later (at least according to presently accepted theory about light). Now, imagine gravity working the same way. Since, as Newton's laws require, the sun, in the heliocentric model, is continually tugging at the Earth so that the Earth does not go flying off into space, then the force of gravity must be absolutely constant. Current science believes that the force of gravity travels from the sun to the Earth in 8.5 minutes or more. But this slow speed of gravity is not said to be a problem because, as is the case for light from the sun, the gravity sent from the sun to the Earth has been undisturbed for thousands of years. Its slow speed will not cause any problems because it already has an established connection between the sun and the Earth.

Although this may solve one problem, it creates another. By the same theoretical principle, if the sun were suddenly to stop issuing the force of gravity, the Earth would immediately depart from its orbit, the same as when we cut the string from a ball being twirled around in a circle. Once the string is cut, the ball will depart its orbit.[26] Conversely, light doesn't need an anchor in order to propagate. But since gravity is a radial force in Newtonian physics, it must operate under different laws. If not, then Newton's laws cannot be applied to the orbits of planets. The question remaining is: what principle of physics would account for the *immediate* reaction of the Earth if the gravitational "string" between them were suddenly cut?[27] This is similar to the problem that Newton had in explaining why the water in a spinning bucket would curve upward.

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[26] General Relativity tries to explain this dilemma by postulating that gravity isn't really a "force," per se, but only the result of matter (in this case, the matter of the sun and the planets) bending time and space, that is, the Earth follows a path that has been created by the sun pulling space into a circular frame.

[27] According to physicist Tom Van Flandern, gravity travels at least 2×10^{10} times faster than light. Van Flandern cites several methods of testing this speed, among them: (1) the angular momentum argument of binary pulsars, showing that the position, velocity, *and acceleration* of each mass is anticipated in much less than the light-time between the masses; (2) a non-null, three-body experiment involving solar eclipses in the Sun-Earth-Moon system, showing that optical and "gravitational" eclipses do not coincide; (3) neutron interferometer experiments, showing a dependence of acceleration on mass, and therefore a violation of the

As we noted earlier, General Relativity has its own problems in explaining gravity (and, for the record, Quantum Mechanics has no explanation for gravity). Physicist Thomas Van Flandern has pointed out many problems in General Relativity's hypotheses about gravity, and with good reason. Not only has General Relativity failed to provide adequate answers for stellar aberration, rotation, and action-at-a-distance (that is, without resorting to Mach's "distant rotating masses"), Van Flandern reminds us that

> …it is not widely appreciated that this [General Relativity] is a purely mathematical model, lacking a physical mechanism to initiate motion. For example, if a "space-time manifold" (like the rubber sheet) exists near a source of mass, why would a small particle placed at rest in that manifold (on the rubber sheet) begin to move toward the source mass? Indeed, why would curvature of the manifold even have a sense of "down" unless some force such as gravity already existed. Logically, the small particle at rest on a curved manifold would have no reason to end its rest unless a force acted on it.[28]

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weak equivalence principle (the geometric interpretation of gravitation); (4) the Walker-Dual experiment, showing in theory that changes in both gravitational and electrostatic fields propagate faster than the speed of light, *c*, a result reportedly given preliminary confirmation in a laboratory experiment. Being a heliocentrist, Van Flandern also depends on what he understands as: (5) a modern updating of the classical Laplace experiment based on the absence of any change in the angular momentum of the Earth's orbit (a necessary accompaniment of any propagation delay for gravity even in a static field); and (6) planetary radar-ranging data showing that the direction of Earth's gravitational acceleration toward the Sun does not coincide with the direction of arriving solar photons, but these can also be explained in the geocentric system by simply reversing the roles of Earth and Sun. (T. Van Flandern, *Physical Letters* A 250, 1998, 1-11; T. Van Flandern, *Dark Matter, Missing Planets and New Comets,* North Atlantic Books, Berkeley, CA, 1993; T. Van Flandern, "Relativity with Flat Spacetime," *Meta Research .Bulletin* 3, 9-13, 1994; T. Van Flandern, "Possible new properties of gravity," Parts I & H, *Meta Research Bulletin* 5, 23-29 & 38-50, 1996; "The Speed of Gravity: What the Experiments Say," *Meta Research Bulletin*, Oct. 18, 2002; Walker, W. D., "Superluminal propagation speed of longitudinally oscillating electrical fields," abstract in *Causality and Locality in Modern Physics and Astronomy: Open Questions and Possible Solutions,* S. Jeffers, ed., York University, North York, Ontario, #72, 1997).

[28] "Gravity" in *Pushing Gravity*, p. 94.

We might also add, if Relativity assumes a uniform curvature of space around any celestial body, why does Relativity accept that the orbits of the planets around the sun are elliptical instead of circular? According to Relativity, the planets stay in their orbits because they are following the "curved path of spacetime." Nothing is said about an elliptical path being an inherent feature of spacetime.

Regarding the problem Newtonian mechanics has in explaining either the spinning water bucket or the fate of a planet cut from the sun's gravity, General Relativity seeks to answer the problem by postulating the presence of "gravitational fields" which act as a type of agent passing between source and target, able to convey an action, and therefore dependent on the principle of causality. But since that is the case, Van Flandern retorts that

> …all existing experimental evidence requires the action of fields to be conveyed much faster than lightspeed. This situation is ironic because the reason why the geometric interpretation gained ascendancy over the field interpretation is that the implied faster-than-light action of fields appeared to allow causality violations [*e.g.*, moving backwards in time, according to the principles of Special Relativity]….Yet the field interpretation of General Relativity requires faster than light propagation. So if Special Relativity were a correct model of reality, the field interpretation would violate the causality principle, which is why it fell from popularity.[29]

Quantum astrophysicists see the same dilemma for General Relativity. Brian Greene writes:

> At the end of the day, no matter what holistic words one uses or what lack of information one highlights, two widely separated particles, each of which is governed by the randomness of quantum mechanics, somehow stay sufficiently "in touch" so that whatever one does, the other instantly does too. And that seems to suggest that some kind of faster-than-light something is operating between them. Where do we stand? There is no ironclad, universally accepted answer.[30]

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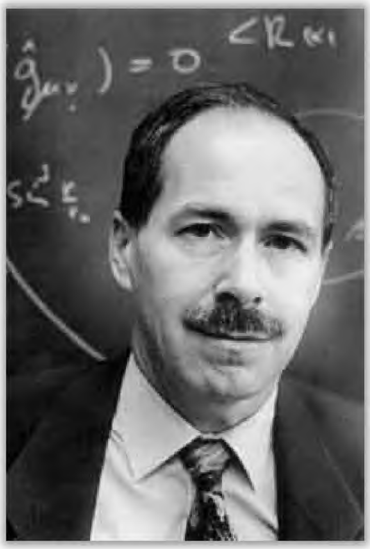
[29] "Gravity," pp. 94-95.

[30] Brian Greene, *The Fabric of the Cosmos: Space, Time and the Texture of Reality*, pp. 117-118.

Gerardus 't Hooft, a 1999 Nobel Laureate and theoretical physicist at Utrecht university puts things in perspective. Although Quantum Mechanics has been ballyhooed as science's greatest achievement, Dr. t' Hooft responds that it "is not the ultimate theory of nature...quantum mechanics is simply how the ultimate theory of nature is revealed to us." In an interview for *Discover*, science correspondent Kathy Svitil concludes that…



> The heart of the problem is gravity. General relativity describes the way gravity operates on large scales but does not explain its origin. Quantum mechanics describes the subatomic world where the forces of nature arise, but it turns increasingly vague over extremely small distances. Quantum theory falls apart entirely at the Planck length – an unimaginably minuscule distance some 10^{-20} times the size of a proton – which is precisely where gravity holds sway. In 't Hooft's view, the universe follows orderly rules at the Planck length…[31]

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[31] *Discover*, May 2003, p. 13; Gerald 't Hooft, *Salamfestschrift*, eds., A. Ali, J. Ellis and S Randjbar-Daemi, World Scientific, Singapore, 1993. Gia Dvali, a physicist from New York University, says much the same: "Gravity is the biggest mystery. It's the oldest force we know, but we still understand so little about it" (*Discover*, October 2005, p. 57).

As Svitil says, gravity remains the unsolvable problem for any theory of physics. If, as ‘t Hooft suggests, the universe consists of a sea of Planck-dimension particles, there may be some means of discovering not only gravity’s *physical* cause but also the “action-at-a-distance” problem that has been around since Isaac Newton first broached the subject.

In his 1998 paper, Van Flandern posited that the speed of gravity must travel at least 10 magnitudes higher than the speed of light. He writes: “Laboratory, solar system, and astrophysical experiments for the “speed of gravity” yield a lower limit of 2×10^{10} *c*.”[32] Following Van Flandern’s assertion, a team led by Sergei Kopeikin of the National Radio Astronomy Observatory took advantage of Jupiter’s passing between Earth and the quasar J0842 + 1835 to test the speed of gravity. Kopeikin measured the gravity field distortions caused by Jupiter and published his results in December 2002 to a worldwide audience. Kopeikin stated that the speed of gravity was equal to the speed of light within a 20% margin of error.[33] Van Flandern then analyzed Kopeikin’s data and found serious anomalies:

> New findings announced today by S. Kopeikin are invalid by both experimental and theoretical standards….In 2001, S. Kopeikin proposed an experiment to test the speed of gravity.[34]
>
> However, his result as described would have been a hybrid of near-instantaneous effects and lightspeed-delayed effects. The physical interpretation in his proposal… was objected to by T. van Flandern and independently by H. Asada.[35] ….the mistake made by Kopeikin is not unlike measuring the speed of a falling apple and claiming that is the speed of gravity. All gravitational phenomena unique to Einstein’s relativity (GR)…arise in a static or near-static gravitational potential field…. Disturbances of this potential field or medium are called “gravitational waves.” According to GR, such waves propagate at the speed of light, as do all other phenomena associated with the potential field that propagate at all. This speed has been confirmed indirectly by

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[32] “The Speed of Gravity – What the Experiments Say,” *Physics Letters A*, 250:1-11, 1998. He adds: “The speed of gravity…has already been proved by six experiments to propagate much faster than light, perhaps billions of times faster.”

[33] *Astrophysical Journal Letters*, April 10, 2003.

[34] “Testing the relativistic effect of the propagation of gravity by a very long baseline interferometry,” *Astrophysical Journal*, 556:L1-L5.

[35] Van Flandern, 2002: (http://metaresearch.org/home /viewpoint/Kopeikin.asp) and H. Asada in *Astrophysical Journal*, 574:L69-L70.

> binary pulsar observations. There is no current dispute about this, and no expectation of any other result for the propagation speed of gravitational waves. However, the name notwithstanding, "gravitational waves" have nothing to do with gravitational force. They are ultra-weak disturbances of the potential field or space-time medium due to acceleration of bodies. So far, they have proved too weak to detect directly in any laboratory or astrophysical experiment. They are certainly far too weak to have any influence on any macroscopic body in their path.[36]

Remarking further on gravity's speed, Van Flandern states:

> Why do photons from the Sun travel at the speed of light in directions that are not parallel to the direction of the Earth's gravitational acceleration toward the Sun? Why do total eclipses of the Sun by the Moon reach mid-visible-eclipse about 40 seconds before the Sun and Moon's gravitational forces align? How do binary pulsars anticipate each other's future position, velocity, and acceleration faster than the light time between them

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[36] Van Flandern, "The speed of gravity," *Meta Research* Press Release, January 8, 2003. To support Van Flandern, in the section of their book titled "Detection of Gravitational Waves," Misner, Thorne and Wheeler state: "Man's potential detectors all lie in the solar system, where gravity is so weak and spacetime so nearly flat that a plane gravitational wave coming in remains for all practical purposes a plane gravitational wave" (*Gravitation*, p. 1004). They add: "Just as one identifies as 'water waves' small ripples rolling across the ocean, so one gives the name 'gravitational waves' to small ripples rolling across spacetime….Propagating through the universe, according to Einstein's theory, must be a complex pattern of small-scale ripples in the spacetime curvature" (*Gravitation*, p. 943), showing that "gravitational waves" are peculiar to Einstein's spacetime, not a measure of the speed of gravity. They are merely disturbances in the gravity already present. Van Flandern also noticed that Kopeikin changed the terms of the Einstein equation in order to have the speed of gravity not exceed c. Kopeikin "…rules out the possibility of c_g = infinity or $c_g >> c$ in his results even before the experiment is performed. Kopeikin defined a new time $\tau = (c/c_g)t$ to replace the coordinate time t in the Einstein equation. However, because (c/c_g) is obviously forced to become very small or zero for large or infinite c_g, the role of the time coordinate is diminished or suppressed altogether by his substitution, which effectively eliminates many relativistic effects already verified in other experiments." In short, Van Flandern shows that Kopeikin was not measuring the speed of gravity, but was interpreting the data in reference to what he already believed about the speed of gravity from General Relativity.

> would allow? How can black holes have gravity when nothing can get out because escape speed is greater than the speed of light, and how can they continue to update their external gravity fields?[37]

Van Flandern also proposes that the gravity-carrying medium (gravitons) and the light-carrying medium (which he calls "elysium") are separate and distinct, although occupying the same space.[38] This would be similar to the two-ether theory of Rothwarf, wherein the electropon medium is contained within a Planck-particle medium.[39] Obviously, each ether operates on a different scale, since plancktons are 10^{-20} smaller than electrons and positrons. The electron-positron medium will both be controlled by what travels in the Planck medium, *i.e.*, gravity, which will be seen in cases of refraction and other such electromagnetic-affecting phenomena.

Where the Le Sage model did not have a satisfactory answer for the perihelion of Mercury (since Mercury's mass makes no contribution to the perihelion), Van Flandern's "elysium" helps explain what might be the physical cause for Mercury's ellipse:

> One of Louis de Broglie's chief contributions to physics was demonstrating that ordinary matter has wave properties too. We are therefore obliged to consider that orbiting bodies will be influenced by the density of the Elysium that they travel through because of the influence of Elysium on their electrons. Qualitatively, therefore, the elliptical motion of orbiting bodies is slowed most by elysium near perihelion, were that medium is densest; and is slowed least near aphelion, where Elysium is sparsest. This velocity imbalance (relatively slower at perihelion, relatively faster at aphelion) rotates the ellipse forward, which is

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[37] "The Speed of Gravity – What the Experiments Say," *Physics Letters A*, 250:1-11, 1998. As just one example of his evidence, Van Flandern remarks that data from the US Naval Observatory shows that the "Earth accelerates toward a point 20 arc seconds in front of the visible Sun, where the sun will appear to be in 8.3 minutes."

[38] Van Flandern also notes that "The reason for the failure of quantum physics to successfully model gravitation at a quantum level using these entities [the hypothetical 2-spin gravitons] should now be readily evident: the two completely different media are needed for elysium (the light-carrying medium) and for the gravitational-force carrying agents" ("Gravity," p. 116).

[39] Rothwarf, Frederick R and Sisir Roy "The Time Dependence of Fundamental Constants and Planck Scale Physics," November 14, 2003.

> what an advance of perihelion means….This speed-change concept works well for purely wave phenomena, and allows the elysium concept to predict the first three tests of General Relativity because of its effect on the speed of light.[40]

Whereas it can be shown that light traveling from the sun to Earth has a displacement aberration of 20 arc seconds (which in the heliocentric system is caused by the speed of the Earth, but in the geocentric system is caused by the speed of the sun), gravity between the sun and Earth has no such "aberration" effect, and thus it provides no indication of a propagation speed. In other words, gravity propagates with an instantaneous, or even infinite speed, which was precisely what Newton assumed to be the case.

Tom van Flandern (1940 – 2009)

In dealing with the problem of drag forces and heat which would be caused by both the elysium and graviton ethers, **Van Flandern** proposes that the ethers dissipate heat equal to the level of absorption, summed up in the mathematical formulas of Victor Slabinski.[41] As Van Flandern explains:

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[40] "Gravity," p. 99. We should also add that Simhony's electron-positron ether lattice affects the electromagnetic material in a similar way. Although Van Flandern does not say it here, we could also add that the reason atomic clocks run at different speeds at ground level as opposed to high altitudes is due to the varying densities of ether medium close to Earth's surface as opposed to further away.

[41] "Notes on gravitation in the Meta Model," *Meta Research Bulletin* 7, 33-42; and "Force, Heat and Drag in the Graviton Model," Victor J. Slabinski, in *Pushing Gravity*, pp. 123-128. As Van Flandern summarizes: The gravitational constant (Slabinski's equation 16) depends on the products of absorption and scattering

> So heat is deposited by gravitons, then is leisurely lost as the elysium circulates and freshens in separate activities that are not part of the graviton absorption/scattering process. This brings to mind the heat generated by a refrigerator. Most of it must be siphoned off and dumped to allow the important part of the process to operate. The net result is just what we need to make the Le Sage graviton model work.[42]

Van Flandern then cites the Michelson-Gale and Sagnac experiments:

> Direct measurements of the speed of radio signals through near-Earth space in the Global Positioning System (GPS) show no detectible speed variation down to the level of at most 12 m/s. From that, we can conclude that elysium does not rotate with the Earth (as first shown by the Michelson-Gale experiment in 1925). The classical Sagnac experiment of 1913 indicates that elysium also does not rotate with a spinning laboratory platform, which is why a Michelson-Morley-type experiment on a rotating platform does detect fringe shifts. Therefore, elysium constituents must be quite small compared to atomic nuclei – something we might already have inferred from their lack of detection by experiments.[43]

We see here that, although Van Flandern may have a viable alternative to the question of gravity, being a heliocentrist, he will interpret the GPS and interferometer experiments with respect to a rotating Earth (*i.e.*, "elysium does not rotate with the Earth"). But since in Van Flandern's model the elysium does not rotate with the Earth, then it does not move laterally with the Earth's revolution around the sun, and this creates a problem for him. For if the Sagnac experiment, as he admits, shows absolute rotation against the elysium, then the elysium does, indeed, have measurable effects, and thus the combined effect of heliocentrism's Earth rotating (465 meters/sec) and revolving (30,000 meters/sec) should show up in interferometer experiments and GPS lag times, but they do not. Van Flandern accounts for this anomaly by postulating: "Therefore, the elysium constituents must be quite small compared to atomic nuclei –

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coefficients, the latter being huge compared to the former. Meanwhile, the heat flow (Slablinski's equation 19) depends only on the absorption coefficient (the part of the heat absorbed by matter instead of by elysium), and is therefore miniscule in comparison" ("Gravity," p. 105).

[42] "Gravity," p. 105.

[43] "Gravity," p. 116.

something we might already have inferred from their lack of detection by experiments." In other words, the elysium, although moving against the Earth at great speed (0.465 km/s + 30 km/s), has little or no effect on our instruments because of its infinitesimally small constitution. But how small must this medium be while at the same time being large enough to both carry light waves and outsize the graviton medium? Van Flandern does not say. The problem with having a suitable light-carrying medium is that, since the frequency of light's wave is 3×10^8 meters/sec, the velocity of any medium-dependent wave is the square root of the medium's elasticity divided by its density. Thus, supporting a wave moving at the speed of light would require a medium with a very high tensile strength and rigidity, but a medium so porous yet resilient that it produces "no detectable speed variations" on the planets which move through it, yet snaps back into its former position immediately. At the same time, this medium is invisible and non-reactive to our human senses. Is there such a medium?[44] We have already offered the biblical firmament as the perfect medium, and we will develop the idea more in later chapters.

In the geocentric model wherein the Earth is immobile and the ether is moving only slightly against it (1-4 km/sec), there is much less need to have the ether at infinitesimally small dimensions, since there is no need to account for high resistance. For example, as we noted earlier, if one of the ethers were an electron-positron plasma, we have a medium that is relatively close in size to atomic nuclei, yet both elastic and dense enough to support the speed of an electromagnetic wave, as well as supporting massive objects like planets and stars, without being appreciably affected. The other significant feature of the electron-positron plasma is that it has been positively identified. Unfortunately, as we noted earlier, it has also been positively misinterpreted as originating from the creation of matter from energy.

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[44] Other theories of gravitons include the "fat graviton" developed by Raman Sundrum of the University of Washington. As Sundrum is motivated by having to deal with the problem caused by the impossible energy created in equations that are based on quantum space containing infinitetesimal particles that pop in and out of existence (10^{120} times greater than what we observe), Sundrum proposes that gravitons are actually about 1/200th of an inch in size, yet the graviton "barely interacts with the matter and energy roiling through 'empty space, thereby eliminating the 10^{120} error…" In this model, "the fat graviton tends to skip over objects smaller than itself, so gravity should start to weaken over such short distances" (*Discover*, October 2005, pp. 56-57). Steven Weinberg had estimated the energy of the cosmological constant to be 10^{113} GeV, which amounts to a density of about 10^{89} grams per cubic centimeter (*Reviews of Modern Physics*, January 1989).

Incidentally, although Van Flandern says that the GPS shows no detectible speed variation, he qualifies this remark by saying "down to the level of at most 12 m/s." The Global Positioning Satellites have a 50-nanosecond discrepancy between the GPS and the ground stations. The "50 nanoseconds" corresponds to the 12 meters/second to which Van Flandern refers. Although Van Flandern does not say it here, the 12 m/s disparity is due mainly to the Sagnac effect. In the end, although Van Flandern says there is "no detectible speed variation," if, after taking into account that radio signals from the GPS must travel about 13,000 miles to the ground stations, there remains a 12 m/s difference in the reaction time between Earth and the GPS, we then have a residual time-lag between Earth and GPS that is comparable to the fringe shifts of the classic interferometer experiments.[45]

"Dark" Problems for Newtonian Gravity

Another problem for current cosmology is that, according to Newton's laws, the universe must have enough matter and energy to fill the enormous spaces left by its so-called "expanding universe." As it stands, even when all the matter in the universe is added up, the Big Bang theory has only 5% of what it needs to make the model work. Based on Newton's laws, there simply is not enough matter to account for the gravity and the luminosity normally associated with matter. In other words, there is 95% more gravity and light than there should be. As *Discover* magazine put it:

> ...when astronomers try to use Newton's equations on larger scales, say, to predict the movements of the stars orbiting the center of a galaxy, they get the wrong answers. In every single

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[45] The plane of the GPS orbit is the Earth's equator, and the GPS circle the Earth at an altitude of about 20,000 km (13,000 miles) and complete two full orbits per day. In the heliocentric model, this requires a speed twice that of Earth's rotation. Since the Earth's rotation at the equator is 465 meters/sec, the GPS are traveling at least 930 meters/second. Assuming the 12 meter/second lag, there is a 2.6% disparity between the radio signals and the movement of the GPS against Earth. Interestingly enough, forty years of interferometer experiments show a similar disparity (10% - 2.6%) between the speed of ether against the Earth (3000-8000 meters/second) and the speed of the Earth in its supposed revolution around the sun (30,000 meters/second). Since the ground stations for the GPS are not situated on the equator but are at various latitudes, this would increase the percentage of disparity from 2.5% to 5.0% at latitudes where the rotation speed is 50% of the equator's, to 7.5% at latitudes where the rotation speed is 25% of the equator's.

> galaxy ever studied, the stars and gas move faster than Newton's laws say they should.[46]

To compensate for this, modern science has invented the matter they need. According to the best estimates, the required matter and energy makes up 95% of the universe yet with one major caveat – it cannot be seen or detected. The name given to this mysterious but as yet undiscovered substance is Dark Matter, and its cousin is Dark Energy. Essentially, the Dark Energy/Matter combination has the distinguished job of providing at least fourteen times more energy for the universe than the collective energies of all the stars, galaxies and black holes. Without Dark Matter and Dark Energy, a whole host of problems would occur. For example, galaxies, because they are spinning so fast, should be flying apart at the seams. Similarly, the constellations simply couldn't hold themselves together. Dark Matter comes to the rescue, for it provides the necessary mass for Newton's inverse-square law to operate, and thus act, as Eric Lerner quips, as the "invisible glue" that keeps everything from flying apart.[47] Without it the stars in the night sky would collapse and move against one another.[48] To accomplish this feat, however, Dark Matter must be very dense as compared to the matter in galaxies, but this creates an additional problem, since it will require the cores of the galaxies to be hundreds or thousands of times denser than they actually have been observed to be. In addition, the Dark Matter model requires that the smallest galaxies should have been the first to form from the Big Bang and, over time, should become denser than other galaxies, but the raw evidence shows just the opposite. The converse of this scenario should be just as viable, however. If 95% of the universe is claimed to be Dark Matter, and if we find in the end that Dark Matter does not exist, we might hypothesize that the size of the universe has been estimated to be 95% bigger than it really is.

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[46] Tim Folger, "Nailing Down Gravity," *Discover*, October 2003, p. 36.

[47] Eric J. Lerner, *The Big Bang Never Happened*, New York, Random House, 1991, p. 13. He adds: "Finnish and American astronomers, analyzing recent observations, have shown that the mysterious dark matter isn't invisible – it *doesn't exist*….But that's not all: dark matter had to be quite different from ordinary matter…one of the two key predictions of the Big Bang was the abundance of helium and certain rare isotopes – deuterium (heavy hydrogen) and lithium. These predictions also depend on the density of the universe. If the dark matter was ordinary matter, the nuclear soup of the Big Bang would have been overcooked – too much helium and lithium, not enough deuterium. For theory to match observation, omega for ordinary matter, whether dark or bright, had to be around .02 or .03, hardly more than could be seen. If it wasn't ordinary matter, what could the dark matter be? Around 1980 worried cosmologists turned to the high-energy particle physicists. Were there any particles that might provide the dark matter but wouldn't mess up the nuclear cooking? Indeed, there just might be. Particle physicists provided a few possibilities: heavy neutrinos, axions, and WIMPs (Weakly Interacting Massive Particle – a catch-all term). All these particles could provide the mass needed for an omega of 1, and they were almost impossible to observe. Their only drawback was that, as in the case of cosmic strings, there was no evidence that they exist. But unless omega equaled 1 (thus lots of dark matter), the Big Bang theory wasn't even self-consistent. For the Big Bang to work, omega *had* to be 1, and dark matter *had* to exist. So, like the White Queen in *Through the Looking Glass* who convinced herself of several impossible things before breakfast, cosmologists decided that 99 percent of the universe was hypothetical, unobservable particles" (*ibid*., pp. 13, 34-35). See also: Evidence for a Non-Expanding Universe: Surface Brightness Data from HUDF. Lerner states:

Another name given to the invisible Dark Matter is the acronym WIMP, which stands for "weakly interacting massive particles." So far, even the most sensitive detectors have not registered any WIMPs.[49] But without these "fudge factors," as the well-known theoretical physicist at Los Alamos National Laboratory in New Mexico, Michael Nieto, calls them, other scientists, such as Israeli physicist Mordehai Milgrom, propose that Newton's laws need to be radically reworked. Gravity cannot be said to be directly proportional to acceleration, he says, but "proportional to the square of the acceleration." Milgrom, speaking for the scientific community, is saying that Newton's laws are inadequate, and possibly incorrect. Perhaps due to coincidence his mathematical equations work in certain confined areas (*e.g.*, our solar system), but it is certainly not because Newton discovered the universal essence of gravity and motion. As Folger states, "...Newton's and Einstein's laws will be in for some

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"The data is clearly compatible with the non-expanding hypothesis and clearly incompatible with the expanding hypothesis, even with evolution. The universe, therefore, is not expanding," First Crisis in Cosmology Conference, AIP Conference Proceedings, Vol. 822, held in Moncao, Portugal, 23-25 June 2005. Edited by E.J Lerner and J.B. Almeida., p. 73 of pp. 60-74.

[48] See *Discover*, Bob Berman, "Sky Lights Meet the Dark Universe," Vol. 25, No 10, October 2004, p. 36. A recent issue of *Science* showed that modern cosmologists believe that the universe is 4% luminous matter; 26% Dark Matter; and 70% Dark Energy (Robert Irion, "The Warped Side of Dark Matter," *Science*, 300:1894, June 22, 2003).

[49] Writing in *Nature*, Geoff Brumfiel states: "Researchers from the Cryogenic Dark Matter Search II…have been looking for a type of theoretical particle called weakly interactive massive particles, or WIMPs….The new detector is four times more sensitive than any previous experiment….However since it started running in November last year, the detector has not seen a single WIMP" ("Particle no-show pans former find," *Nature*, May 6, 2004, p. 1).

major tweaking."[50] An alternate theory called "Modified Newtonian Dynamics" (MOND) is a little better in explaining the anomalies.

David Spergel, astrophysicist at Princeton University and member of the Wilkinson Microwave Anisotropy Probe launched by NASA June 30, 2001, states in an interview with *Discover*:

> The thing I'm most excited about is the precision....We know that ordinary matter accounts for only 4% of the mass of the universe. The rest consists of dark matter. It confirms many of the predictions we've been making.

Later in the interview when Folger asks: "Have we answered all the big questions," Spergel replies:

> There are still a bunch of them. What is dark matter? What is dark energy, the unseen thing that seems to be driving the universe to speed up? Those are fundamental questions. Another big one is understanding what caused inflation, the extremely rapid expansion that occurred in the universe's first moment of existence. WMAP and other experiments are just beginning to probe the physics of the early universe. And right now we have a model in which 4 percent of the universe is atoms and 96 percent is something else unidentified. I think it's hard to claim that we know it all![51]

Spergel admits that he has never detected Dark Matter, has never seen it, and doesn't even know what it is, yet in the face of all that ignorance he is positive it is out there, and he even knows that "dark energy" (which he also can't detect) is propelling it. He also admits that science is "just beginning to probe the physics of the early universe," and doesn't know what caused the so-called "rapid expansion," but he is nonetheless positive that there was a Big Bang and that the universe is expanding. This is the point much of today's science has come to – speculative theory is assumed as fact.

Yet there is even more to the story. Without Dark Matter to balance the equations, not only do Newton's laws need to be reworked, and not only is the Big Bang teetering on the scaffold, but Einstein's General

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[50] *Discover*, October 2003, p. 40.

[51] *Discover*, May 2003. Similarly, Nobel Laureate Stephen Weinberg stated: "I cannot deny a feeling of unreality in writing about the first three minutes [of the Big Bang] as if we really know what we are talking about" (*The First Three Minutes: A Modern View of the Origin of the Universe*, 1977, p. 9).

Relativity theory is nullified, for it gives the same solutions to matter and motion as Newton's laws, and is the engine for the Big Bang theory. As we noted earlier, Einstein produced his General Relativity field tensors by finding a math equation that he could work backward into Newton's force equations.[52] As one physicist honestly put it:

> Dark matter is needed if one assumes Einstein's field equations to be valid. However, there is no single observational hint at particles which could make up this dark matter. As a consequence, there are attempts to describe the same effects by a modification of the gravitational field equations, *e.g.* of Yukawa form, or by a modification of the dynamics of particles, like the MOND ansatz, recently formulated in a relativistic frame. Due to the lack of direct detection of Dark Matter particles, all those attempts are on the same footing.[53]

In reality, if there is no Dark Matter, then insofar as Newton and Einstein are involved, we have a classic case of the blind leading the blind. With all this negative evidence against Dark Matter one might predict that sooner or later it will be exposed for the myth that it appears to be. Recently one of the most comprehensive and reliable studies seeking to detect Dark Matter, the Hipparcos astrometry satellite, concluded the following: "The local dynamical density comes out as $\rho_0 = 0.076 \pm 0.015$ M_{υ} pc^{-3}, a value well below all previous determinations leaving no room for any disk shaped component of dark matter."[54] In other words, the study has given the most accurate confirmation to date that there is no Dark Matter in the disc of the Milky Way. If there is no Dark Matter in the disc, we can logically assume that there is no such matter in the cosmos at large. Consequently, if the Dark Matter that science is depending upon to answer the anomalies in Newtonian and Einsteinian physics is now removed from their repertoire of pat answers, they will be forced to find alternatives. Only time will tell what they will be.

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[52] The 8π component in Einstein's field equation, G = 8πT (in which G is the Einstein tensor and T is the stress or energy-momentum tensor), was added by determining what factor was necessary in order to make Einstein's equation equal to Newton's equation. This is why General Relativists, such as Misner, Thorne and Wheeler, can say: "The field equation [G = 8πT] even contains within itself the equations of motion ("Force = mass × acceleration") for the matter whose stress-energy generates the curvature" (*Gravitation*, p. 42). Cahill shows the inevitable problem with this approach: "…Newtonian gravity is now known to be seriously flawed, and so *ipso facto*, by using this postulate [3: "in the limit of low speeds the gravity formalism should agree with Newtonian gravity"] Einstein and Hilbert inadvertently developed a flawed theory of gravity" and "General Relativity does not permit the 'dark matter' effect, and this happens because General Relativity was forced to agree with Newtonian gravity, in the appropriate limits, and that theory also has no such effect" ("The Einstein Postulates: 1905-2005: A Critical Review of the Evidence," in *Einstein and Poincare: The Physical Vacuum*, 2006, pp. 131, 137).

[53] C. Lämmerzahl, O. Preuss and H. Dittus, "Is the Physics within the Solar System Really Understood," ZARM, University of Bremen, Germany; Max Planck Institute for Solar System Research, Germany, April 12, 2006, p. 2.

Many other such anomalies exist for the Big Bang theorists that we cannot cover in detail here. Suffice it to say that, such problems have created a major crisis in cosmological science. So far, every theory that is developed to explain the observable phenomenon is invariably contradicted by other theories. As Paul J. Steinhardt of Princeton University resigned himself to say: "If we only had one problem to worry about, you might blame it on [modeling], but when you have five problems, it's not so easy to dismiss them."[55] David Hilton, Caltech physicist, adds: "The question we ask ourselves is, 'Now what?' It's still a puzzle," to which his partner Jonathan Dorfan of Berkeley, amusingly adds: "In the end there is irrefutable evidence that we are here."[56] Thank God for that.

Geocentrists do not have such problems because, almost to a man, they understand that God created the galaxies as they presently appear. If smaller galaxies are not denser than larger galaxies, the simple reason is that they were all created simultaneously with the same density. Moreover, the spiral galaxies may act as clocks for the universe, since the more rapidly spinning core measured against the more slowly moving arms will only allow a limited amount of time before the spiral is wound up into a giant ball, and it will be completed in a few thousand years, not the 13.5 billion for which modern science seeks. In any case, it is interesting to see how tenaciously modern scientists hold on to the concept of Dark Matter even though they have no physical proof that it exists. Yet these scientists

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[54] M. Crézé, E. Chereul, O. Bienaymé and C. Pichon, "The distribution of nearby stars in phase space mapped by Hipparcos," *Astronomy and Astrophysics*, Sept. 3, 1997, p. 1. On the accuracy of Hipparcos, the authors state: "Since the accuracy of Hipparcos magnitudes is far beyond the necessities of this study, the sampling biases can only result from two effects: the parallax errors which, however unprecedently small are still of the order of 10% beyond 100 pc, and the stars lost at the time of the early selection due to the inaccuracy of apparent magnitudes available then" (*ibid.*, p. 5).

[55] "A Cosmic Crisis? Dark Doings in the Universe" *Science News Online*, Oct. 13, 2001, by Ron Cowen.

[56] "Antimatter," *Discover*, August 2004, p. 71.

– after the same man whose theories led them to the concept of Dark Matter, Albert Einstein – are the very people who reject the existence of ether because it is said to be "undetectable." The ether was indeed detected but was either ignored or misunderstood, since science was working on another wrong premise – an Earth in motion.

Gravity has always been the sticking point in any physical or even theoretical physics model. It is not easily explained when it works as expected, much less when it doesn't follow any of the rules. Not only is it true that Newton's "laws" do not work for galaxies, but more disturbing anomalies have come to the surface. For example, scientists discovered that space probes such as "*Pioneer 10*, launched in 1972…seems to be defying the laws of gravity. [It] has been slowing down, as if the gravitational pull on it from the sun is growing progressively stronger the farther away it gets."[57] The same anomalies were noticed of *Pioneer 11*, as well as the *Ulysses* and *Galileo* probes.

> *Pioneer 10* is not the only spacecraft acting strangely. *Pioneer 11*, launched in 1973, also slowed down as it pulled away from the sun, right until NASA lost contact with it in 1995. And there's some evidence of similar bizarre effects on two other probes: *Ulysses*, which has been orbiting the sun for 13 years, and *Galileo*, which plunged into Jupiter's atmosphere last month.[58]

Commenting about these peculiar incidents, Michael Nieto concludes: "We don't know anything. Everything about gravity is mysterious."[59] Thomas Bowles, working at the same institution, admits: "Right now, we don't have a theory of how gravity is created."[60] Indeed, it is well to remind ourselves of the fact that neither Newton nor Einstein could explain the how and why of gravity. As Koestler vividly points out:

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[57] "Nailing Down Gravity," *Discover*, October 2003, p. 36.

[58] *Ibid*. In the comprehensive paper "Is the Physics within the Solar System Really Understood?" Lämmerzahl, Preuss and Dittus (Max Planck Institute, April 12, 2006, pp. 1-23) show that the Pioneer anomalies cannot be explained by: dust, additional masses in the solar system, an accelerated sun, or the drift of clocks on earth. In addition to the Pioneer anomalies, the Lämmerzahl team remark on the "flyby" anomalies (occasion in which satellites, after swinging by Earth, possess a significant unexplained velocity increase of a few mm/s), and demonstrate that atmosphere, ocean tides, solid earth tides, charging of the spacecraft, magnetic moment, earth albedo, solar wind or spin-rotation coupling explain the problem. The team also shows that the Astronomical Unit has increased over time and that comets return a few days before predicted arrival, both without explanation.

[59] "Nailing Down Gravity," *Discover*, October 2003, p. 36.

[60] *Nature Reviews*, "Gravity Leaps into Quantum World," January 17, 2002, by Tom Clarke, p. 2.

> With true sleepwalker's assurance, Newton avoided the booby-traps strewn over the field: magnetism, circular inertia, Galileo's tides, Kepler's sweeping-brooms, Descartes' vortices – and at the same time knowingly walked into what looked like the deadliest trap of all: action-at-a-distance, ubiquitous, pervading the entire universe like the presence of the Holy Ghost. The enormity of this step can be vividly illustrated by the fact that a steel cable of a thickness equaling the diameter of the Earth would not be strong enough to hold the Earth in its orbit.[61]

Indeed, as Koestler implies, modern science should be holding its head in shame for all the grandiose theories of the universe it has produced over the years when the simple fact is it doesn't have the slightest clue how the most fundamental force of the universe works. The intractable nature of gravity is demonstrated, as Koestler notes, in the image of a 8000-mile-wide steel cable not being able to counteract the centrifugal force of the Earth revolving around the sun, while a mere kitchen magnet stuck to the door of a refrigerator can defy gravity. Not surprisingly, we find that

> Newton's concept of a "gravitational force" has always lain as an undigested lump in the stomach of science; and Einstein's surgical operation, though easing the symptoms, has brought no real remedy….Newton, in fact, could only get over the "absurdity" of his own concept by invoking either an (sic) ubiquitous ether (whose attributes were equally paradoxical) and/or God in person. The whole notion of a "force" which acts instantly at a distance without an intermediary agent, which traverses the vastest distances in zero seconds, and pulls at immense stellar objects with ubiquitous ghost-fingers – the whole idea is so mystical and "unscientific," that "modern" minds like Kepler, Galileo, and Descartes, who were fighting to break loose from Aristotelian animism, would instinctively tend to reject it as a relapse into the past….What made Newton's postulate nevertheless a modern Law of Nature, was his mathematical formulation of the mysterious entity to which it

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[61] *The Sleepwalkers*, p. 511.

> referred. And that formulation Newton deduced from the discoveries of Kepler…[62]

Complaints against Newton's theory are a constant dripping on the disciplines of physics and astronomy. As one author put it:

> …classical [Newtonian] mechanics, with its principle of inertia and its proportionality of force and acceleration, makes assertions which not only are never confirmed by everyday experience, but whose direct experimental verification is fundamentally impossible: one cannot indeed introduce a material point all by itself into an infinite void and then cause a force that is constant in direction and magnitude to act on it; it is not even possible to attach any rational meaning to this formulation. And of all the experiments by means of which textbooks of mechanics are wont to prove the fundamental law of mechanics, not a single one has ever been carried out in practice.[63]

Dennis W. Sciama writes: "The Newtonian scheme contains arbitrary elements,"[64] while Halliday and Resnick complain that in Newton's theories there are "serious questions of logic that can be raised."[65] One obvious issue of logic involves the matter of cause and effect. As Oleg Jefimenko describes it, Newton's laws have "serious flaws" because, being "simultaneous in time" they do not "represent a causal relation." Additionally, "Newton's gravitational law conflicts with the conservation of momentum law," since a "gravitational field cannot propagate instantaneously."[66] Even more to the point is the quote from Heinrich Hertz, the famous discoverer of radio frequencies in the late 1800s:

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[62] *The Sleepwalkers*, p. 344. In addition to "Einstein's surgical operation" which "brought no real remedy," Koestler reminds us that "…'universal gravity' or 'electro-magnetic field' became verbal fetishes which hypnotized it into quiescence, disguising the fact that they are metaphysical concepts dressed in the mathematical language of physics" (*ibid.*, p. 508).

[63] E. J. Dijksterhuis, *The Mechanization of the World Picture*, 1969, pp. 30-31. My thanks to van der Kamp for some of these citations.

[64] Dennis W. Sciama, *The Unity of the Universe*, 1961, p. 125.

[65] David Halliday and Robert Resnick, *Physics for Students of Science and Engineering*, 1963, p. 89.

[66] Oleg D. Jefimenko, *Gravitation and Cogravitation*, 2006, pp. 7-8.

> It is exceedingly difficult to expound to thoughtful hearers the very introduction to mechanics without being occasionally embarrassed, without feeling tempted now and again to apologize, without wishing to get as quickly as possible over the rudiments and on to the examples which speak for themselves. I fancy that Newton himself must have felt embarrassment.[67]

Similarly, F. A. Kaempffer writes:

> Newton's second law is certainly one of the most obscure of all the understandable relations underlying our description of the physical world in which we find ourselves. Anyone who has ever tried to explain this law to a person who insisted on asking questions will know the difficulty of giving good reasons for the facts embodied in it....Newton was well aware of these difficulties, as were others, but could find no satisfactory answer to them.[68]

Not only are anomalies about gravity being discovered above and below the surface of the Earth, but the same discrepancies are being discovered on its surface. For example, the results of Galileo's famed Pisa experiment have recently come into question. As we remember the story, Galileo climbed the tower of Pisa and proceeded to drop two objects, one much heavier than the other, at the same time. Galileo observed that both objects appeared to fall at the same rate of speed. This finding was in contrast to the view held by Aristotle, the Greek philosopher and scientist, who believed that the heavier object would fall faster (at least that is the view commonly attributed to Aristotle).[69] But scientists have found that other factors, such as the dimensions of the object (*e.g.*, whether it is compact or elongated), have a direct effect on the speed with which the object falls to Earth. These variations are not due to the resistance of air. These sensitive experiments are performed in vacuums. For example, experiments performed with the ultra-sensitive Cavendish torsion balance reveal that elongated objects, made of the same material as compact objects, fall slower than the latter in a vacuum. When this was discovered a few years ago, some bewildered scientists tried to answer the surprising results by postulating a fifth fundamental force called "supergravity." The same experiments also found a discrepancy in Newton's famed inverse-square law, to the tune of 0.37%, quite innocuous to the average Joe on the street, but a gaping hole in the world of science.[70]

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[67] David Halliday and Robert Resnick, *Physics for Students of Science and Engineering*, 1963, p. 88.

[68] David Halliday and Robert Resnick, *Physics for Students of Science and Engineering*, 1963, p. 89.

[69] Many historians and scientists believe Aristotle did not hold that the heavier object falls faster; rather, he held the correct view that an object starting from a greater height will fall faster to the Earth than an object starting from a lesser height. The misunderstanding arises because Aristotle's writings on this point are somewhat ambiguous. Nevertheless, if we were to understand the downward force on an object at rest at a certain height as equal to the force needed to keep it at that particular height, and if we assigned the term "weight" to this force as Aristotle did, then it would certainly be true that the "weight" of an object would be greater the faster it falls. Similarly, because falling objects accelerate, more force is required to stop a falling object than to hold the same object at rest.

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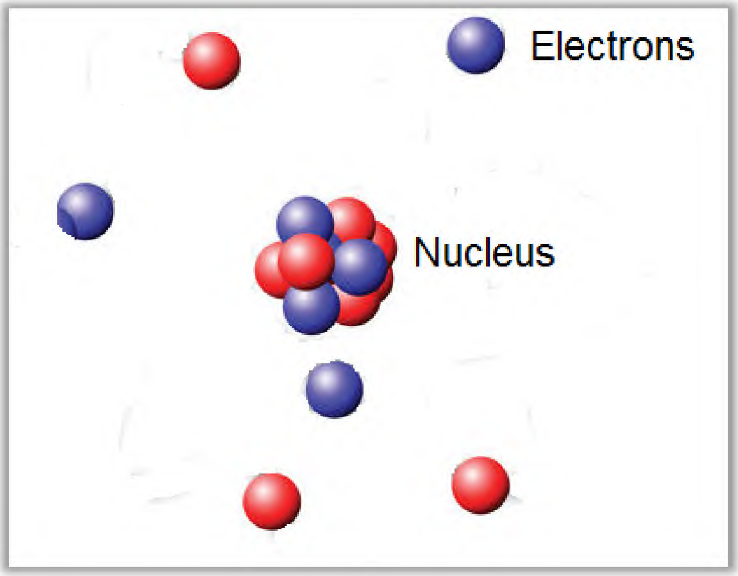
[70] D. R. Long, "Experimental Examination of the Gravitational Inverse Square Law," *Nature*, April 1976, Vol. 260, pp. 417-418. More recently, experiments in pendulum behavior just prior to eclipses and within deep mine shafts have consistently presented severe anomalies in Relativity's theory of gravitation (see *Physical Review* D3, 823 and *General Relativity and Gravitation*, Vol. 24, No. 5, 1992, pp. 543-550; S. C. Holding and G. J. Tuck "A New Mine Determination of the Newtonian Gravitational Constant," *Nature*, Vol. 307, Feb. 1984, pp. 714-716; D. R. Long, "Why Do We Believe Newtonian Gravitation at Laboratory Dimensions?" *Physical Review* D 9 (1974) 850-852; D. R. Mikkelsen, M. J. Newman, "Constraints on the Gravitational Constant at Large Distances," *Physical Review*, D 16, 1977, 919-926; B. Schwarzschild, "From Mine Shafts to Cliffs: The 'Fifth Force' Remains Elusive," *Physics Today*, July, 21, 1988; C. C. Speake et al., "Test of the Inverse-Square Law of Gravitation Using the 300 m Tower at Erie, Colorado," *Physical Review Letters* 65, 1990b, 1967-1971; F. D. Stacey, G. J. Tuck, "Geophysical Evidence for Non-Newtonian Gravity," *Nature* 292, 1981, 230-232; C.W. Stubbs et al, "Limits on Composition-Dependent Interactions Using a Laboratory Source: Is There a 'fifth force' Coupled to Isospin?" *Physical Review Letters* 62, 1989b, 609-612). Ephraim Fischbach, after analyzing the data from Eötvös experiments in the 1920s, which asserted that gravitational acceleration was independent of mass, concluded this was incorrect and that there was evidence of a limited composition-dependent "fifth force" that opposed gravity. His paper caused an uproar in the physics world (E. Fischbach, D. Sudarsky, A. Szafer, C. Talmage and S H. Aronson, *Physical Review Letters* 56, 3, 1986). Luigi Foschini, "Short Range Gravitational Fields: The Rise and Fall of the Fifth Force" (CNR Institute, 2002), claims to have solved this problem. Others, such as Peter Saulsan of MIT, say that the "fifth force" does not disturb General Relativity since hypercharge has an approximate range of only 200 meters. Charles Brush has demonstrated that metals of high atomic weight and density fall slightly faster than those of lower atomic weight and density, even though the same mass of each metal is used; and that the weight of metals changes with its physical condition (Charles F. Brush, "Some new experiments in gravitation," Proceedings of the American Philosophy Society, vol. 63, pp. 57-61,

The Physical Cause of Gravity

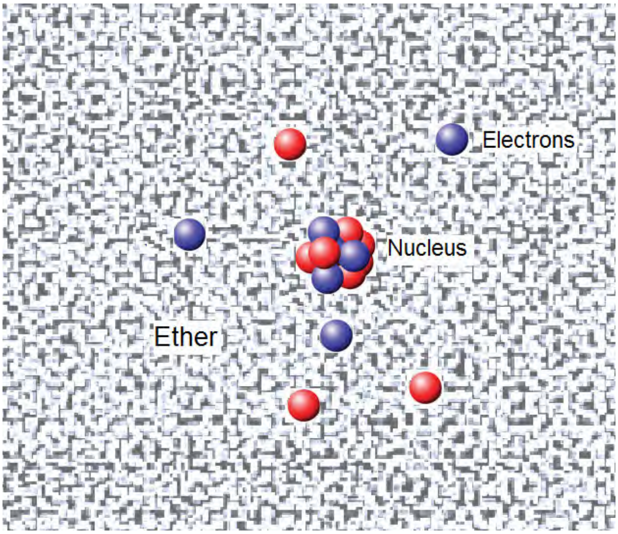
Once we understand that space is not a vacuum but is filled with an ether composite consisting of minute particles from the size of electrons and positrons to the Planck dimensions or beyond, we have the basis upon which to offer a physical cause for gravity.

In the past, science understood the atom to be composed mostly of empty space, but that is no longer the case. Protons, neutrons and electrons are now understood to compose a mere fraction of the total mass of the atom, the rest of the atom being comprised of the universal ether. As such, the ether is the primary building block of matter that holds everything together. The nucleon and its electrons are only distinctions in the vast ether sea.



1924). Victor Crémieu demonstrated gravitation measured in water on the surface of the Earth is greater by one-tenth than that determined by Newton's theory (V.Crémieu, "Recherches sur la gravitation," *Comptes Rendus de l'Académie des Sciences*, Dec. 1906, pp. 887-889). D. Kelly has shown, when the absorption capacity is reduced by magnetizing or electrically energizing a material body, it is attracted at a lesser rate by Earth's gravity (Josef Hassleberger, "Comments on gravity drop tests performed by Donald Kelly," *Nexus*, Dec. 1994-Jan. 1995, pp. 48-49).

The most important principle in determining the physical cause of gravity is to understand the specific relationship between the atom and the ether. In the atom the mass of the nucleon and its accompanying electrons is displacing a certain amount of the universal ether. In other words, the ether serves as the interstitial substance that fills the so-called "empty space" of the atom.



If the ether penetrated the nucleus and electron, the same difference would hold due to the emptiness of the atom.[71] Since atomic particles are less dense than ether, yet occupy a definite position within the ether inside the atom, this means that the total density of the ether within the atom will be less than the density of ether outside the atom. This imbalance will cause an ether vacuum between the inside and outside of the atom. Since nature abhors a vacuum, the ether will seek to distribute itself in order to eliminate the vacuum. *In short, ether's effort to eliminate the vacuum is the cause of gravity*. That is, the less-dense ether inside the atom will attempt to draw in the denser ether outside the atom. This vacuum force will continue until equilibrium is reached, but, in fact, equilibrium is never reached, and thus the force of gravity between the two objects persists indefinitely.

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[71] That is, the ether penetrates the atom, but it does not penetrate either the nucleus or the electrons. This is not surprising in light of what we already know about atomic particles. Protons, for example, have been found to be virtually indestructible and they do not decay. So stable is the proton that experiments reveal its average lifetime must exceed 10^{32} years. Although protons have been theorized to consist of other particles (*e.g.*, leptons, quarks), nevertheless, in the cosmic realm the proton remains indestructible. Whereas 100 MeV is needed to remove an electron from an atom, and 10^{6} MeV to remove protons from neutrons, it would take 10^{11} MeV to break down a proton. In fact, protons may be the fundamental particle, opposing the hypothesis today that there are even smaller particles, such as quarks and leptons. As Heisenberg noted: "First of all there is the thesis that the observed particles such as the proton, the pion, the hyperon consist of smaller particles: quarks, partons, gluons, charmed particles or whatever else, none of which have been observed. Apparently here the question was asked: "What does a proton consist of?" But the questioners appear to have forgotten the phrase "consist of" has a tolerably clear meaning only if the particle can be

The next logical question is: of two objects, what makes the smaller object fall toward the larger object? The answer is simple. In Newton's case, for example, the apple falls to the Earth because the larger the mass, the stronger the vacuum. The Earth, which is the larger mass, will create a stronger ether vacuum than a smaller mass, and thus the smaller mass (the apple) will be drawn toward the larger mass by the force of the Earth's greater ether vacuum. The reason the Earth creates a greater ether vacuum than the apple creates is that the more atomic mass an object has, the less interstitial ether it will possess in its given volume, and thus the greater the imbalance it will have with the ether outside its mass. The Earth, having more mass than the apple, has less interstitial ether within its particular volume and thus a greater ether vacuum.

By the same principle, Jupiter will have more gravitational force than the Earth because Jupiter, having more atomic mass than Earth, will have less interstitial ether for its given volume, and thus create a greater ether vacuum, which then attempts to pull more forcefully the ether from outside the planet in order to reach equilibrium. As the vacuum in the inside ether

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divided into pieces with a small amount of energy, much smaller than the rest mass of the particle itself. ...In the same way I am afraid that the quark hypothesis is not really taken seriously today by its proponents. Questions dealing with the statistics of quarks, the forces that keep them together, the reason why the quarks are never seen as free particles, the creation of pairs of quarks inside an elementary particle, are all left more or less undefined. If the quark hypothesis is really to be taken seriously, it is necessary to formulate precise mathematical assumptions for the quarks and for the forces that keep them together and to show, at least qualitatively, that all these assumptions reproduce the known features of particle physics" Werner Heisenberg, "The Nature of Elementary Particles," *Physics Today*, 29 (3), 32 (1976). Corroborating Heisenberg's objections, the proton may indeed be the fundamental nuclear particle since at the Planck temperature (10^{32}K), the black body radiation curve peaks at a wavelength which is equal to the size of the proton.

pulls the outside ether, it necessarily pulls the mass housing the outside ether.

A number of important observations can be made, illustrating the explanatory power of the ether-vacuum model of gravity:

- It explains why gravity is best understood as an “attractive” force, since the greater vacuum generated by the larger mass is forcing the smaller mass to be drawn toward it.

- It explains why gravity is a radial force. Since all material objects are curved, they will create an ether vacuum and attract objects outside of them based only on their radial geometry. Whereas Einstein claimed that matter curved space (and the curve was understood as the force of gravity), in reality it is matter that is curved and which then attempts to pull in the “space” (ether) around itself at every point on its curved surface.

- It explains why, in the local environment, the intensity of gravity lessens with distance on a geometrical scale, based on the inverse square law. The vacuum tension caused by the imbalance of ether will lessen as the distance increases, since the farther that material objects are from one another, the less imbalance of ether will exist between them.

- It explains why objects accelerate as they fall to Earth. The force from the vacuum in the Earth’s ether is much greater than what the object can resist, therefore it falls. But since the object has a measure of resistance against the ether due to its specific atomic mass, the force of the ether vacuum, although pulling at one constant rate, will only gradually be able to bring its force upon the object. The more time available to bring the vacuum force upon the object, the greater will be the object’s acceleration. (time becomes more available by increasing the distance the object falls).

- It explains why objects of differing mass placed at the same height will fall at the same rate of acceleration. The acceleration of an object is proportional to the amount of ether within the object and the resistance the object offers against the ether due to the object’s mass. An object of more mass has less interstitial ether, but by the same token, because of its greater mass it has greater resistance to being pulled by the vacuum of ether outside of its mass.

Conversely, an object of less mass has more interstitial ether (and therefore the vacuum force is not as great), but less resistance (and therefore the vacuum will have an easier task moving it). All in all, the proportions balance completely so that large and small masses will fall at the same rate.

- It explains "action-at-a-distance," that is, why gravity can stretch for long distances and react instantaneously. The extreme density of the ether, which is accentuated by its rotation with the universe, allows it to act as an absolute rigid body, and thus it will allow even the smallest vibrations to be transmitted speedily over long distances.

- It explains the relationship between gravity and inertia. Since a material object is constantly attempting to reach ethereal equilibrium with its environment, the force created by the constant effort is inertia. By the same token, since in the presence of no mass and thus no ether vacuum, the energy of a force applied to a material object will not diminish, thus the object will remain in motion unless acted upon by a net external force. It is the ether that transmits the energy of the force and also keeps it constant.

- It explains why atoms experience the Sagnac effect. Since the ether forms an interstitial environment throughout the atom, it will allow the electrons to circle the nucleus in absolute motion.

A simple equation to represent the process between the ether and the atomic particles is:

$$\vec{F}_g = \frac{GM_1/E_d \times M_2/E_d}{R^2}$$

Where:

- $\vec{F}_g$ = force of gravity
- M_1 and M_2 = respective masses of atomic particles
- E_d = ether density
- R^2 = square of distance between M_1 and M_2
- G = the gravitational constant

Applied to Atomic Particles

If we apply the same ether density formulation to atomic particles, we can ascertain how forces behave within the atom. This formulation is the alternative to the Strong and Weak nuclear forces in the Standard Model. This model combines the force of gravity with the strong and weak nuclear forces as being derived by one basic phenomenon – the vacuum created by the universal Planck ether medium. Here is how it would work: Protons and neutrons take up space in the nucleus and thus displace a proportionate amount of the Planck ether. Electrons do the same. Because protons and neutrons have more mass than electrons, they displace less ether than the electron. As such, there is an ether vacuum created inside the atom at the level of the nucleus (*i.e.*, the lower density ether in the nucleus seeks to reach equilibrium with the higher density ether of the electron). The result is that the ether vacuum holds the electrons to the nucleus. At the same time, the charge of the electron causes it to move around the nucleus (just as light automatically moves forward when discharged). A balance is thus established between the electron's forward inertia and the inward pull of the electron toward the lower ether density nucleus. (This is analogous to the Standard Model's weak nuclear force). The result is a stable atom for atomic structures, at least those within a certain atomic number margin. Radiation occurs in higher numbered atomic elements (*e.g.*, uranium, plutonium) because the electron population and its attending charges exceeds the strength of the ether vacuum and thus the atom releases electrons. As for the analogy to the Standard Model's strong nuclear force, ether displacement by neutrons creates a sufficient ether vacuum in the nucleus that is used to keep the positively charged protons from separating.

Applied to Spiral Galaxies

If we apply the same ether density formulation to spiral galaxies which spin ten times faster than the basic equation $F = Gm_1m_2/r^2$ will allow, the variable in this case is the density of the ether (E_d). Just a slightly higher density will be enough to compensate for the extra rotation curve.

He stretches out the north over the void, and hangs the
earth upon nothing.

He binds up the waters in his thick clouds, and the cloud is
not rent under them.

He covers the face of the moon,
and spreads over it his cloud.

He has described a circle upon the face of the waters at the
boundary between light and darkness.

Job 26:7-10

"The current state of knowledge can be summarized thus: In the beginning, there was nothing, which exploded."

Terry Pratchett[72]

"The great power of science is its ability, through brutal objectivity, to reveal to us truth we did not anticipate."

Robert Laughlin[73]

"It is impossible to convince a person of any true thing that will cost him money."

Robert Laughlin[74]

"You cannot depend on your eyes when your imagination is out of focus."

Mark Twain[75]

"Something unknown is doing we don't know what – that is what our theory amounts to."

Arthur Eddington[76]

"If the speed of light were discovered not to be constant, modern scientific theory would be devastated."

Marilyn vos Savant[77]

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[72] Terry Prachett, *Lords and Ladies*, 1996, p. 7.

[73] Robert Laughlin, *A Different Universe, Reinventing Physics from the Bottom Down*, 2005, p. xvi. Laughlin is a Nobel laureate in physics.

[74] *Ibid*., p. 114.

[75] Twain's Notebook, 1898.

[76] Sir Arthur Eddington, *The Nature of the Physical World*, from the 1927 Gifford Lectures at the University of Edinburgh, 1929, p. 291.

[77] Marilyn vos Savant is the Guinness world's record holder for the highest IQ, currently at 208. The above response was given in answer to the question: "What one discovery or event would prove all or most of modern scientific theory wrong?" (cited from "Ask Marilyn," Parade magazine, May 22, 1988.

Chapter 8

How Old and How Big is the Geocentric Universe?

One of the more popular endeavors of physicists and astronomers today is to design an accurate model of the origin, age, and size of the universe. Unfortunately, this is an area fraught with speculation and uncertainty. As John Horgan notes:

> Cosmology, in spite of its close conjunction with particle physics, the most painstakingly precise of sciences, is far from being precise itself. That fact has been demonstrated by the persistent inability of astronomers to agree on a value for the Hubble constant, which is a measure of the size, age, and rate of expansion of the universe. To derive the Hubble constant, one must measure the breadth of the red shift of galaxies and their distance from the Earth. The former measurement is straightforward, but the latter is horrendously complicated. Astronomers cannot assume that the apparent brightness of a galaxy is proportional to its distance; the galaxy might be nearby, or it might simply be intrinsically bright…. The debate over the Hubble constant offers an obvious lesson: even when performing a seemingly straightforward calculation, cosmologists must make various assumptions that can influence their results, they must interpret their data, just as evolutionary biologists and historians do. One should thus take with a large grain of salt any claims based on high precision…. Our ability to describe the universe with simple, elegant models stems in large part from our lack of data, our ignorance. The more clearly we can see the universe in all its glorious detail, the more difficult it will be for us to explain with a simple theory how it came to be that way. Students of human history are well aware of this paradox, *but cosmologists may have a hard time accepting it.*[78]

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[78] John Horgan, *The End of Science*, 1996, p. 111, emphasis added.

As modern science's interpretation of the Michelson-Morley experiment was made from the presupposition that the Earth was moving through space, so today, elaborate models of the universe are made from the presupposition that there is no center to the universe, and that the Earth is at least 4.5 billion years old in a universe at least 13.7 billion years old (which figure has decreased from the original 20 billion proposed only a decade ago). In cataloguing the theories of the universe that have appeared just in the last century, one witnesses a myriad of competing and conflicting ideas, each one trying to reach the pinnacle with a "theory of everything" – the king of the hill that cannot be supplanted.

Much of the theorizing has been for the sole purpose of trying to make the universe self-sustaining, both in its origin and continuation. As we have pointed out many times, the main reason for modern science's quest is to take God out of the picture. If by some over-arching "laws" of physics the universe can be understood to appear virtually out of nowhere and perpetuate itself indefinitely, science has accomplished its long awaited Nietzschean goal of making God's existence superfluous. These efforts are led by such icons as Stephen Hawking who, after making suggestions for the origin of the universe, concludes:

> Thus all the complicated structures that we see in the universe might be explained by the no-boundary condition for the universe together with the uncertainty principle of quantum mechanics…So long as the universe had a beginning, we could suppose it had a creator. But if the universe is really completely self-contained, having no boundary or edge, it would have neither beginning nor end: it would simply be. *What place, then, for a creator*?[79]

"What place…for a creator?" Hawking shows that the pursuit of modern cosmology is not a casual endeavor but a full frontal assault on what was heretofore the exclusive domain of theology. Hawking even boasts of having circumvented a papal directive on the limits of cosmological speculation:

> In 1981 my interest in questions about the origin and fate of the universe was reawakened when I attended a conference on cosmology organized by the Jesuits in the Vatican. The Catholic Church had made a bad mistake with Galileo when it tried to lay down the law on a question of science, declaring that the sun

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[79] *A Brief History of Time*, pp. 140-141, emphasis added.

> went around the Earth. Now, centuries later, it had decided to invite a number of experts to advise it on cosmology. At the end of the conference the participants were granted an audience with the pope. He told us that it was all right to study the evolution of the universe after the big bang, but we should not inquire into the big bang itself because that was the moment of Creation and therefore the work of God. I was glad then that he did not know the subject of the talk I had just given at the conference – the possibility that space-time was finite but had no boundary, which means that it had no beginning, no moment of Creation. I had no desire to share the fate of Galileo, with whom I feel a strong sense of identity, partly because of the coincidence of having been born exactly 300 years after his death![80]

Beginning with the Copernican revolution, not only has cosmological science sought to correct the Church's so-called "outdated" medieval science, it seems to have no trepidation sticking its head into the sacred world of the divine. Hence, the forbidden fruit has been bitten once again, and the serpent is leading man into thinking that he can become a god and determine his own fate. As Carl Sagan gloated: "A universe that is infinitely old requires no Creator."[81] Or his quip: "I would suggest that science is, at least in part, informed worship."[82] Fortunately, those of us who refuse to be swept away into the presumptuous boasts of modern science are comforted by the Scriptural words: "The fool hath said in his heart, 'There is no God.'"[83]

If anyone thinks that cosmology is merely an issue of science, let him think again. These men are driven by ideology, and one of their chief goals is to rid the world of the notion of God and, most of all, of being morally responsible to anyone greater than themselves. Albert Einstein, for example, dismissed the existence of God based on his reluctance to submit himself to reward and punishment from a divine being whom he understood as a contradiction in terms. Although he was quite adept at combining space and time, Einstein refused to couple divine sovereignty with human free agency and, therefore, rejected the notion of a personal God altogether. His journals also tell us that he had a deep resentment toward Catholic priests in general. The popular concept of Einstein as the meek and mild professor whose only desire was truth and who was merely indifferent to Christianity's claims is mere propaganda. In addition to his atheism, Einstein led quite an immoral life (See Vol. II, Ch. 11).

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[80] *A Brief History of Time*, p. 116.

[81] Carl Sagan, *Cosmos*, 1980, p. 243.

[82] *The Varieties of Scientific Experience: A Personal View of the Search for God*, Carl Sagan and Any Druyan, 2006, p. 31. Throughout the book, Sagan is rather disconcerted, even angry, that God, if he exists, did not make himself more easily known to man. Sagan suggests, for example, that God should have put a giant crucifix in orbit around the Earth to make his intentions clear (p. 167). Like most men, Sagan fails to see that God has made himself known by the very things Sagan sees in his telescope (Rm 1:19-20) but that God also hides himself from people like Sagan because they refuse to admit their sins (Rm 1: 18, 21-32).

[83] Psalm 14:1.

In the realm of science, Einstein knew precisely what was at stake in the experiments of Arago, Airy, Fizeau and Michelson-Morley. He realized that unless science could come up with a convincing counter-explanation, the whole world would be worshiping at the feet of the Catholic Church, for she had stood her ground in the seventeenth century against the Copernican revolution. That Einstein would invent his fantastic theories precisely for such an ulterior motive has been noted several times in this volume. His colleagues did much the same. Echoing the sentiments of Stephen Hawking are the words of Arthur Eddington (the one man who catapulted Einstein to fame by his selective use of eclipse photographs) regarding his motivations for theories of cosmological origins that he preferred:

> The difficulty of applying this case [the cosmology of Lemaître] is that it seems to require a sudden and peculiar beginning of things….Philosophically, the notion of a beginning of the present order of Nature is repugnant to me….I should like to find a genuine loophole.[84]

Considering that Eddington classed himself among an impeccable group of men that claimed to examine all scientific evidence objectively, we wonder how he and his colleagues could allow "philosophy" to get into the mix to determine cosmological origins. Of course, we already know the answer to that question. Modern science has shown itself to be anything but objective, especially when it comes to the subject of origins.[85]

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[84] Arthur Eddington, "On the Instability of Einstein's Spherical World," in *Monthly Notices of the Royal Astronomical Society*, 90, 1930, p. 672; and "The End of the World: from the Standpoint of Mathematical Physics," *Nature*, 127, 1931, p. 450, *The Fingerprint of God*, p. 66.

[85] The lack of objectivity among modern scientists regarding origins was probably stated no better than by geneticist Richard Lewontin: "We take the side of science in spite of the patent absurdity of some of its constructs, in spite of its failure to fulfill many of its extravagant promises of health and life, in spite of the tolerance of the scientific community for unsubstantiated just-so stories, because we have a

Although Eddington does not reveal it here, the reason "a beginning is repugnant" to him is that it necessitates the existence of a Creator, a Being to whom Eddington would be held accountable for his actions. Indeed, that particular idea is "repugnant" to modern man.

Astronomer Fred Hoyle, who, as we have seen earlier, was quite candid of his support of the geocentric cause by saying that "…the difference between a heliocentric and a geocentric theory is one of motions only, and that such a difference has no physical significance," is also quite frank about the philosophical motivations for preferring the former over the latter within a multi-billion year "Universe":

> The attribution of a definite age to the Universe, whatever it might be, is to exalt the concept of time above the Universe, and since the Universe is everything, this is crackpot in itself….God is identically equal to the universe.[86]

These ideas, however, did not start with Einstein, Eddington, or Hawking. They are as old as the hills. Yet, we can trace the accelerated development of scientific atheism to the so-called "Enlightenment," to the burgeoning philosophies and sciences that made it their objective to dethrone Christianity as the principal teacher of mankind. The lynch-pin of the whole affair, of course, was Copernican cosmology. Nothing could be accomplished until the Earth was demoted from its privileged place at the center of the universe. Although the Copernicans never really won the war, and, in fact, the battle is still being fought in our present day, nevertheless, they have succeeded in giving the *impression* they have won, and unfortunately, impressions rule the hearts of men. As Lakatos puts it:

> The Ptolemaists did their thing and the Copernicans did theirs and at the end the Copernicans scored a propaganda

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prior commitment, a commitment to materialism. It is not that the methods and institutions of science somehow compel us to accept a material explanation of the phenomenal world, but, on the contrary, that we are forced by our *a priori* adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counterintuitive, no matter how mystifying to the uninitiated. Moreover, that materialism is absolute, for we cannot allow a Divine Foot in the door" ("Billions and Billions of Demons," *The New York Review of Books*, January 9, 1997, pp. 28, 31).

[86] Fred Hoyle, "The Universe: Past and Present Reflections," *Annual Reviews of Astronomy and Astrophysics*, 20, 1982, p. 3; Fred Hoyle and Chandra Wickramasinghe, *Evolution From Space*, New York: Simon and Schuster, 1981, p. 143.

> victory….Therefore the acceptance of the Copernican theory becomes a matter of metaphysical belief.[87]

The Influence of Isaac Newton

The apparent victory was helped along by many philosophers and scientists, but some of the more prominent names include Isaac Newton (1642-1727) and Immanuel Kant, the former in his book *Philosophiae Naturalis Principia Mathematica* in 1689, and the latter in his 1755 book *Universal Natural History and Theory of the Heavens*.[88] Following Thomas Digges (d. 1595), Isaac Newton proposed that the universe was infinite. This idea was directly contrary to what had been taught for the first 1500 years of the Christian era. As Clark puts it:

> The comfortable idea of a finite universe with the Earth at its center had been suspect from the beginning of the scientific renaissance and had finally been abandoned with the coming of Newton.[89]

Newton's popularity among scientists helped make the concept of an infinite universe immediately acceptable, although he did have a formidable opponent in Gottfried Leibniz. Because Newton's views of the natural world were formed from a mixture of physical principles and spiritual intuition, he often explained the anomalies of his system by appealing to divine intrusion, something for which Leibniz severely criticized him.[90] Newton also dabbled in alchemy and the occult, and these had a great effect on his worldview. As biographer Michael White resolved: "My conclusion is unequivocal: the influence of Newton's researches in alchemy was the key to his world-changing discoveries in science. His alchemical work and his science were inextricably linked."[91]

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[87] Imre Lakatos and Elie Zahar, "Why Did Copernicus' Research Program Supersede Ptolemy's," *The Copernican Achievement*, ed. Robert S. Westman, University of California Press, 1975, p. 367.

[88] Immanuel Kant, *Universal Natural History and Theory of the Heavens, Theories of the Heavens*, editor Milton K, 1957.

[89] *Einstein: The Life and Times*, p. 266. Clark adds: "As Einstein wrestled with the cosmological implications of the General Theory, the first of these alternatives, the Earth-centered universe of the Middle Ages, was effectively ruled out." Clark, however, cites no reason for ruling out the Earth-centered universe.

[90] Leibniz writes: "Sir Isaac Newton, and his followers, have also a very odd opinion concerning the work of God. According to their doctrine, God almighty needs to wind up his watch from time to time; otherwise it would cease to move. He had not, it seems sufficient foresight to make it a perpetual motion. Nay, the machine of God's making, is so imperfect, according to these gentlemen, that he is obliged to clean it now and then by an extraordinary concourse, and even to mend it, as a clockmaker mends his work; who must consequently be so much the more unskillful a workman, as he is often obliged to mend his work and set it right.

As we noted earlier, Newton made no definitive claim to understanding the sole cause of gravity, and, like many of his colleagues, he shifted from supposing it was caused by the inherent nature of matter, to the existence of ether, to the imposition of God. In fact, Newton found the interactions of gravity between the sun and the planets so complicated that he thought God had to adjust them quite frequently to keep things stable.[92] Although his inverse square law certainly helped science predict the effects of gravity, the principle wherein the intensity of a given energy dissipates four-fold for every doubling of the distance is a simple geometric phenomenon that occurs in spherically radiating entities, whether it be light, sound, gas, or gravity. The concentration of the substance will decrease because the area in which it spreads has increased. Kepler had discovered it for light, Newton for gravity. In effect, Newton merely discovered the geometry of gravity, but nothing about its origin or nature.

Newton's concept of gravity is important for one very significant reason – it determines his view of the universe. His initial ideas conceived that the material universe was finite but was surrounded by an infinite void

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According to my opinion, the same force and vigour remains always in the world, and only passes from one part to another, agreeably to the laws of nature, and the beautiful pre-established order...." (Philip P. Wiener, ed., Leibniz Selections, 1951, pp. 216-217).

[91] Michael White, *Isaac Newton: The Last Sorcerer*, 1997, p. 5.

[92] Ivars Peterson, *Newton's Clock: Chaos in the Solar System*, 1993, pp. 16, 226. Peterson writes: "The tangle of mutual gravitational interactions exhibited by the known planets and the sun was so complex that no complete mathematical solution seemed possible. Newton himself had noted certain irregularities in the movements of the planets that he suspected could lead to the disruption of the solar system unless orbits were, in effect, reset at strategic moments. He concluded that divine intervention was periodically necessary to maintain the system's equanimity." Newton also stated: "God...is himself the author and continual preserver of original forces or moving powers…[it is]...not a diminution, but the true glory of His workmanship, that nothing is done without his continual government and inspection. The notion of the world's being a great machine, going on without the interposition of God, as a clock continues to go without the assistance of a clockmaker, is the notion of materialism and fate, and tends to exclude providence and God's government in reality out of the world" (*Introduction to Concepts and Theories in Physical Science*, Gerald Holton, p. 284).

of non-material. But later he reasoned that a finite and bounded universe (*i.e.*, one possessing an edge) would "fall down into the middle of the whole space, and there compose one great spherical mass." He thus proposed that an infinite material universe spread out in infinite space would allow "the fixed stars, being equally spread out in all points of the heavens, to cancel out their mutual pulls by opposite attractions." In other words, Newton needed an infinite universe so that there would be no center in which the universe would collapse in on itself. Thus, in a letter to Richard Bentley in 1692, Newton wrote:

> It seems to me, that if the matter of our sun and planets, and all the matter of the universe, were evenly scattered through all the heavens, and every particle had an innate gravity towards all the rest, and the whole space throughout which this matter was scattered, was finite, the matter on the outside of this would by its gravity tend towards all the matter on the inside, and by consequence fall down into the middle of the whole space, and there compose one great spherical mass. But, if the matter were evenly disposed throughout an infinite space, it could never convene into one mass, but some of it would convene into one mass and some into another, so as to make an infinite number of great masses, scattered great distances from one to another throughout all that infinite space. And thus might the sun and fixed stars be formed, supposing the matter were of a lucid nature.[93]

What distinguished Newton's physics from modern physics is his notion of absolute space and time, which were independent of gravity, whereas Einstein held that space and time were relative and created by gravity, which was in turn created by mass. Newton held that God placed the stars and planets into absolute space and time, while Einstein held that stars and planets evolved and subsequently created space and time. Newton never did explain, however, how there could be absolute space and time in an infinite universe.

Although he believed in physical absolutes and God's providence in guiding the mechanical workings of the universe, we also see in Newton someone who is desperately struggling to make sense out of a temporal world he has constructed and which contains an impenetrable barrier between itself and the absolutes. In effect, Newton's absolutes become nothing more than Platonic images that have only a chimera of reflection in the acentric and infinite cosmos he inherited from Galileo, Digges and Bruno. In this he shows us the dilemma of modern man. He writes:

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[93] Isaac Newton, "To the Reverend Dr. Richard Bentley, at the Bishop of Worcester's House, Park Street, Westminster from Cambridge, December 10, 1692," in *Theories of the Universe*, Milton K. Munitz, 1957.

> Absolute space, in its own nature, without relation to anything external, remains always similar and immovable. Relative space is some movable dimension or measure of the absolute spaces, which our senses determine by its position to bodies and which is commonly taken for immovable space; such is the dimension of a subterraneous, an aerial, or celestial space, determined by its position in respect of the Earth. Absolute and relative space are the same in figure and magnitude, but they do not remain always numerically the same. For if the Earth, for instance, moves, a space of our air, which relatively and in respect of the Earth remains always the same, will at one time be one part of the absolute space into which the air passes; at another time it will be another part of the same, and so, absolutely understood, it will be continually changed.[94]

With an Earth in motion, Newton is forced to give us two worlds, one absolute and one relative, and the Copernican dilemma is perpetuated:

> But real, absolute rest is the continuance of the body in the same part of that immovable space in which the ship itself, its cavity, and all that it contains is moved. Wherefore, if the Earth is really at rest, the body, which relatively rests in the ship, will really and absolutely move with the same velocity which the ship has on the Earth. But if the Earth also moves, the true and absolute motion of the body will arise, partly from the true motion of the Earth in immovable space, partly from the relative motion of the ship on the Earth.[95]

> He only wishes it could be resolved, but knows that it cannot be:
> And so, instead of absolute places and motions, we use relative ones, and that without any inconvenience in common affairs; but in philosophical disquisitions, we ought to abstract from our senses and consider things themselves, distinct from what are

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[94] *Philosophiae Naturalis Principia Mathematica*, 2, trans. Andrew Motte, 1729, revised, Florian Cajori, Berkeley: University of California Press, 1934.

[95] *Philosophiae Naturalis Principia Mathematica*, 4.

> only sensible measures of them. For it may be that there is no body really at rest to which the places and motions of others may be referred.
>
> But we may distinguish rest and motion, absolute and relative, one from the other by their properties, causes, and effects. It is a property of rest that bodies really at rest do rest in respect to one another. And therefore, as it is possible that in the remote regions of the fixed stars, or perhaps far beyond them, there may be some body absolutely at rest, but impossible to know from the position of bodies to one another in our regions whether any of these do keep the same position to that remote body, it follows that absolute rest cannot be determined from the position of bodies in our regions.[96]

The only thing Newton musters to make some sense of his inherited acentric world is reliance on "true motion" determined by "force," but in the end this is also conditional and uncertain:

> It is indeed a matter of great difficulty to discover and effectually to distinguish the true motions of particular bodies from the apparent, because the parts of that immovable space in which those motions are performed do by no means come under the observation of our senses. Yet the thing is not altogether desperate; for we have some arguments to guide us, partly from the apparent motions, which are the differences of the true motions; partly from the forces, which are the causes and effects of the true motions.[97]

Before we leave Newton, we need to reiterate what his "laws" of motion allowed and disallowed regarding the geocentric/heliocentric issue. It is a common presumption that Newton's laws of motion paved the way for the demise of the geocentric view, and that Johannes Kepler put the final nails into the coffin since he "fixed" the Copernican/Galilean solar system by replacing circular orbits with elliptical orbits. This is quite a misconception, however. Kepler's laws showed mathematically how the planets kept pace with observations, but this did not mean, contrary to Kepler, that the sun was the center of the solar system. Kepler believed the sun was the center based on his idea of "mystical harmonics" and other such esoteric beliefs. His goal was to give the sun a privileged position, bestowing it with almost divine qualities.[98] As noted previously, Kepler's goal was directly contrary to the desires of Tycho Brahe from whom Kepler confiscated the data for his heliocentric calculations of planetary motion. Brahe was a devout geocentrist and he implored Kepler to use his meticulous notations to continue supporting the geocentric system. Kepler, under pressure from other influences, forsook the promise he made to Brahe and adopted the heliocentric system.

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[96] *Philosophiae Naturalis Principia Mathematica*, 4.

[97] *Philosophiae Naturalis Principia Mathematica*, 4.

In any case, it has been commonly interpolated from Newton's and Kepler's laws that the smaller body (*e.g.*, a planet) must revolve around the larger body (*e.g.*, the sun) due to the greater mass of the latter. The truth is, however, that none of the planets revolve around the sun; rather, both the sun and the planets revolve around what Newton called the "center of mass," which, in turn, corrected Kepler's third law of planetary motion.[99] Although it is true that, because the sun is so massive compared to the planets that the "center of mass" will be near the center of the sun, the fact remains that it is technically incorrect to say that the smaller body revolves around the larger body. This principle becomes critically important when, for example, we are considering more than two bodies in the system. Our local system has eight planets (including Pluto) and a belt of asteroids to contend against the sun.[100] Charles Lane Poor describes it:

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[98] Kepler writes: "The sun in the middle of the moving stars, himself at rest and yet the source of motion, carries the image of God the Father and Creator….He distributes his motive force through a medium which contains the moving bodies even as the Father creates through the Holy Ghost" (Letter to Maestlin, October 3, 1595, *Gesammelte Werke*, vol. xiii, p. 33, cited in *The Sleepwalkers*, p. 264). "Geometry existed before the Creation, is co-eternal with the mind of God, is God himself (what exists in God that is not God himself?)…" (Kepler's 1618 work *Harmonice Mundi*, Lib. IV, Casper's Biography, I., *Gesammelte Werke*, vol. vi).

[99] Kepler's third law, which took him twenty-two years to complete, is simply $P^2 = R^3$. Here P is the planet's orbital period (measured in sidereal years) and R is the semi-major axis (the distance between the planet and the sun). The Third Law is stated in his *Harmonice Mundi* (Harmony of the World) in the original Latin as: "Sed res est certissima exactissimaque, quod proportio, quae est inter binorum quorumconque planetarum tempora periodica, sit praecise sesquialtera proportionis mediarum distantiarum, id est orbium ipsorum" (V, 3, Prop. 8). For Mercury, P = 0.24 years and R = 0.39 astronomical units, which makes $P^2 = 0.06$ and $R^3 = 0.06$. The other planets are close to the ratio, but not exact. For Venus, P = 0.62 and R= 0.72, then $P^2 = 0.39$ and $R^3 = 0.37$. For Mars, P = 1.88 and R = 1.52, then $P^2 = 3.53$ and $R^3 = 3.51$. For Jupiter, P = 11.9 and R = 5.20, then $P^2 = 142$ and $R^3 = 141$. For Saturn, P = 29.5 and R = 9.54, then $P^2 = 870$ and $R^3 = 868$. For Uranus, P = 84 and R = 19.191, then $P^2 = 7056$ and $R^3 = 7068$. For Neptune, P = 165 and R = 30.071, then $P^2 = 27225$ and $R^3 = 27192$. For Pluto, P = 248 and R = 39.457, then $P^2 = 61504$ and $R^3 = 61429$. Kepler's original application of the Third Law was not quite accurate. Kepler, for example, calculated Saturn's semi-major axis to be 9 A.U. The cube is 729. The square root of 729 is 27, thus the orbital period of Saturn would be 27 years, but this is off by three years, since Saturn revolves around the sun in 30 years (*The Sleepwalkers*, p. 399). Newton modified Kepler's third law to: $(m_1 + m_2)\ P^2 = (d_1 + d_2)^3 = R^3$, in which *m* is the mass of the bodies, and *d* is the distance from each other.

> Now so long as there are but two bodies in the system, these six elements are constant, and the smaller body will travel for ever around and around in its unvarying path. From these elements the actual position of the body at any time, past, present, or future, can be calculated by very simple formulas. If, however, a third body be introduced into our ideal universe, then the motions of the bodies are no longer simple and easily calculated. In fact, the paths of the three bodies become so complicated as to defy any mathematical description. Newton failed to find a solution to this problem; and every mathematician since his time has likewise failed.[101]

Ivars Peterson gives another view:

> [T]he problem of the solar system's stability has fascinated and tormented astronomers and mathematicians for more than 200 years. Somewhat to the embarrassment of contemporary experts, it remains one of the most perplexing, unsolved issues in celestial mechanics. Each step toward resolving this and related questions has only exposed additional uncertainties and even deeper mysteries. The crux of the matter hinges on the fact that it is one thing to write down the equations expressing the laws of motion and a totally different thing to solve those equations. As Newton and his successors quickly discovered, computing the motions of the planets and other bodies in the solar system is no

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[100] In the geocentric system, the Earth is not considered a planet. "Planet" comes from the Greek word πλανήτης meaning "wandering star," denoting that a planet is a body in constant motion. Since Earth is motionless, it is not counted among the planets.

[101] Charles Lane Poor, *Gravitation versus Relativity*, p. 122. Regarding the three-body problem, in 1912, K. F. Sundman attempted a solution based on a converging infinite series, but it converges much too slowly to be of any practical use. As it stands, no method has been developed to solve the equations of motion for a system with four or more bodies.

> simple matter. In fact, the computations are often so complex that researchers now use supercomputers to solve them.[102]

This complexity is one reason Newton believed that God had to intervene frequently in order to "fix" the solar system.[103] But it is also another reason to reject the claim that the Copernican-Keplerian-Newtonian system wins the day because "it is so simple." Simple it is not. The epicycles of Ptolemy are child's play compared to the Newtonian model that must depend on integral and differential calculus to come even marginally close to explaining the perturbations among the planets and moons. Leonhard Euler stated he was overwhelmed in merely accounting for the moon's motion around the Earth, consequently concluding it to be impossible to predict all the perturbations of the entire solar system. Henri Poincaré also became quite involved in these calculations. He more or less revamped all previous methods but concluded that

> [A]lthough the equations representing three gravitationally interacting bodies yield a well-defined relationship between time and position, there exists no all-purpose, computational shortcut

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[102] Ivars Peterson, *Newton's Clock: Chaos in the Solar System*, p. 9. Considering that "super computers" must be employed to rescue man from the failure of Newton's theory to account for the complex motion of the planets, this inevitably leads to the suspicion that Joseph L. Adams' and Urbain J. J. Leverrier's discovery of Neptune as "the final proof of the universal application of Newton's law of gravitation" (as claimed by Morris Kline in *Mathematics and Western Culture*, p. 244) was highly unlikely in 1846. Their "discovery" of Neptune may have been as fortuitous as Jonathan Swift's guess in 1720 in *Gulliver's Travels*, or Kepler's guess in 1610, that if Jupiter had four moons and Earth had one, then Mars had two moons, but which was not verified by observation until 1877. This may be the reason that Wilfred de Fonvielle, to whom Leverrier displayed his calculations, remarked: "What if all that were not mere humbug" (cited in Arthur Lynch's *The Case Against Einstein*, p. 160, note). The same may be true for Percival Lowell's (d. 1916) guess that another planet (Pluto) existed due to perturbations in the orbits of Neptune and Uranus, since after astronomers observed Pluto through a telescope in 1930, it was also discovered that Lowell's calculations were based on fallacious data. I am indebted to N. Martin Gwynne for these astute observations.

[103] As Koestler writes: "He further believed that under the pressure of gravity the universe would collapse 'without a divine power to support it'; and moreover, that the small irregularities in the planetary motion would accumulate and throw the whole system our of gear if God did not from time to time set it right" (*The Sleepwalkers*, p. 536).

> – no magic formula – for making accurate predictions of position far into the future.[104]

From these observations, it was Poincaré who produced what science now calls "dynamical chaos." In the end, Poincaré left Newton's laws of motion unchanged, but he radically altered our understanding of the types of behavior they mandate:

> The true goal of celestial mechanics is not the calculation of the ephemerides [tables of the locations of planets] but rather to discover if all phenomena can be explained by Newton's laws.[105]

The point of all this is to show that, not only are the movements of the heavenly bodies quite complex, it is necessary to account for all the bodies in a given system in order to know the trajectory of their motions. In this light, since Newton's laws of motion are not based on the idea that a smaller body revolves around a larger body but that bodies revolve around a center of mass, Newton's laws also require that, if the masses of all the heavenly bodies and the distances among them are taken into consideration, there will be one center of mass among them all. As we will see, when all the mass of the universe is taken into account, it is no stretch of the imagination to understand that Earth could be at the center of this gigantic bubble. We will cover this subject in more detail later.

The Influence of Immanuel Kant

Left with only the image of absolutes but the reality of relativism, the wall erected by Copernicus and Newton was made impenetrable by Immanuel Kant. After Kant's wrecking ball, man couldn't know anything about the absolute, let alone use it to cope with his existence. In his famous

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[104] Ivars Paterson, *Newton's Clock*, pp. 159-160.

[105] Henri Poincaré, *New Methods of Celestial Mechanics*, ed. Daniel L. Goroff, 1993, Introduction. Poincaré's words are quite apropos in our day, since there have been so many puzzling movements in space, from that of Saturn's moon Hyperion to those of man-made satellites. Evidences of anomalies in Newton's theory suggested themselves when scientists discovered that *Pioneer 10* "seems to be defying the laws of gravity. [It] has been slowing down, as if the gravitational pull on it from the sun is growing progressively stronger the farther away it gets" (Michael Nieto, *Discover*, October, 2003, p. 36). The same anomaly was noticed of *Pioneer 11*, as well as the *Ulysses* and *Galileo* probes.

Critique of Pure Reason,[106] as well as *Religion Within the Limits of Reason Alone*,[107] Kant did away with absolutes, innate ideas (from God), miracles, and just about anything that the medieval theologians had assumed was divinely sacrosanct. Moreover, Kant was influential in many areas of thought, since as a general rule, philosophy has a tendency to filter down over time into the arts, culture, and sciences, thus creating paradigms and superstructures to undergird all the other disciplines.

Kant had convinced the world that he had, indeed, demolished Augustine's and Aquinas' proofs for the existence of God. Things were never quite the same afterward. Although from the Enlightenment's perspective Kant appeared to give vitality and freedom to man's thought, in reality, he put man on a downward slope from which he has not yet recovered, and may never recover. So pervasive was Kant's philosophy he convinced mankind it could know nothing of the material world for certain, since everything man experienced was made such only by the *a priori* "categories of the mind," over which he had no control.

Most people are not aware of the fact that Kant's cosmology had as much influence on man's thinking as Kant's philosophy, enough for him to be called "the father of modern cosmology."[108] In writing the *Critique of Pure Reason*, Kant reveals that he came to the position of demoting pure reason due to two "proofs" about the construction of the universe.[109] In the first, Kant argues that the world must have had a beginning in time, otherwise, at the present time, an infinite number of years would have already elapsed, but that is impossible, thus our reasoning capabilities are inadequate to escape the contradiction. The second proof involves the concept of "empty time" before the world existed. An empty time consists of nothing, and thus it cannot have any differentiation between time intervals. But there is a moment just prior to the beginning of the world, which is differentiated from all previous empty time because of its proximity to the beginning of the world. But if this proximity to the world is supposed to be as empty as the previous intervals, then we have a contradiction, and thus our reasoning fails again. Thus Kant has "critiqued" pure reason so that it cannot serve as a foundation.

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[106] Immanuel Kant, "Critique of Pure Reason," *Great Books of the Western World*, vol. 42, ed., Robert Maynard Hutchins, *Encyclopedia Britannica*, 1952.

[107] Immanuel Kant, *Religion Within the Limits of Pure Reason Alone*, trans. T. M. Green and H. H. Hudson, 1960.

[108] Kant wrote the *Natural History and Theory of the Heavens* in 1755 and the *Metaphysical Foundations of Natural Science* in 1786, both of which held Newton's laws of motion and the celestial mechanics of Copernicanism in the greatest esteem. At the same time, however, he was the first to point out that Newton's laws, contrary to what Newton asserted, could not be derived from observation, and thus Kant refuted the "Baconian myth" that science begins only with observations. As Popper argues: "Newton's dynamics goes essentially beyond all observations. It is universal, exact and abstract; it arose historically out of myths; and we can show by purely logical means that it is not derivable from observation-statements" (*Conjectures and Refutations*, p. 190). Kant's mistake, of course, was his *a-posteriori* belief that Newtonian mechanics is irrefutable.

[109] *Critique of Pure Reason*, p. 454 ff.

These unsolvable contradictions Kant called "antinomies." He concluded that our concepts of space and time are not applicable to the universe at large. Although we can apply space and time to ordinary events, Kant insisted that space and time are not real in themselves and are merely products of our mental intuition that we use to attempt to understand the universe. The only proper use of our mental abilities is as instruments of observation; they supply, as it were, frames of reference for our limited experience. Therefore, if we misapply space and time to issues that transcend our experience (as demonstrated in the two proofs above), our concepts will break down, and thus "pure reason," that is, reason without reliance on our limited sense experience, is impossible.[110]

Another contribution of Kant's was his "primal nebula" theory, which was, in many respects, the proto-type to the modern Big Bang theory. It held that the universe evolved by a gradual formation of galaxies and planets from a collection of molecules in random motion, a process that would continue *ad infinitum*. This was a subtle yet "scientific" attempt to minimize the role of God, while natural forces, with a seeming mind of their own, formed the complex and life-sustaining elements of the universe. For Kant, it was impossible to know anything about the origins of these random particles since, if a divine being created them, the question of his existence was beyond man's capabilities. All in all, Kant gave mankind a strictly mechanistic universe, with no beginning and no end, and, as a proto-Einstein, he introduced the concept that time and space are relative with no absolute counterpart.[111] Kant led science in the direction of a mechanized, impersonal and relativistic universe, and thus he served as a mentor to Einstein. As Arthur Miller notes:

> Seelig (1952) writes that while at Aarau, Einstein did not participate in any of the numerous beer parties because he took seriously Bismarck's advice that "beer makes one dumb and lazy." Instead, continued Seelig, Einstein became "intoxicated on Kant's *Critique of Pure Reason*." Max Talmey, a medical student who dined weekly with the Einstein family, introduced

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[110] *Critique of Pure Reason*, p. 518ff.

[111] *Albert Einstein's Special Theory of Relativity*, p. 170.

> the thirteen-year old Albert to Kant's writings. Talmey recalled that "Kant's works, incomprehensible to ordinary mortals, seemed clear to him."

Infinite Problems with an Infinite Universe

As we saw with science's problematic attempts to interpret the experiments both of stellar aberration and interferometry by means of a heliocentric model, so too, the infinite universe that was proposed to house the celestial bodies had grave problems. A survey of the data allows us to conclude quite safely that all attempts to make the universe infinite were for the express purpose of escaping the necessity of having a center of absolute rest. A finite universe implies a center, and the data allowed little escape from this conclusion. As James Trefil sees the connection:

> By the first years of the twentieth century, astronomers using very clever statistical tools had found that the universe, as we recognized it, was indeed finite. *We were sensibly near the center*."[112]

EDMVND. HALLEIVS LL.D.
GEOM. PROF. SAVIL. & R. S. SECRET.

One of the more serious and still unsolved problems dictating against an infinite universe is what has come to be known as Olbers' Paradox. Actually, astronomer **Edmund Halley**, a contemporary of Newton with whom the latter corresponded quite frequently, discovered the paradox before Olbers. In 1715 Halley reasoned that if the universe were infinite, it would contain an infinite number of stars, which then meant that the night sky should be as bright as daylight. In fact, the entire face of the sky should look as bright as the sun, as if there were thousands of suns in the sky, overlapping each other so that no space would be without light. This paradox was such a glaring problem that no one even proposed a solution for three decades. The first was P. L. de Cheseaux, in 1744, followed almost a century later by **Heinrich W. M. Olbers** in 1823.[113] To resolve the problem, both scientists proposed that a substance (*i.e.*, dust) existed in interstellar space that was absorbing the immense light from the stars, which therefore made the night sky dark.

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[112] James S. Trefil, *Space Time Infinity*, 1985, p. 61.

By the late 1800s, however, science discovered through the works of Josef Stefan and **Ludwig Boltzmann** that matter seeks a point of equilibrium with its environment, and in order to reach that point, it will dissipate as much energy as it consumes. If not, it will build up heat, and if the heat reaches a critical level, the matter will deteriorate. Even if the light were to transpose into infrared radiation, it would still reach Earth. Moreover, even if there were a number of dust particles that reflected light away from the Earth, there would be a proportionate amount that would reflect light toward the Earth, with the net result being the same.

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[113] J. D. North, *The Measure of the Universe*, 1965.

The scattering effect of light is the same reason why on a cloudy day we cannot readily determine the location of the sun. These facts discounted Olbers' explanation, and thus the dark night sky remained a "paradox."[114] Except for one brief attempt to revive Olbers' explanation (which was proposed in 1930 by Robert Trumpler)[115] the astronomical community, either by design or by accident, failed to apply Boltzmann's principles of radiation emission to their quest for the infinite universe until the advent of Hermann Bondi's "Steady State" theory in 1960. Bondi proposed that the energy from the stars was transformed into matter. Logically, if radiation became matter (thanks to $E = mc^2$), then Olbers' Paradox could be solved, since the excess radiation would now have an inexhaustible repository.[116] As Stephen Hawking explains it:

> The steady state theory required a modification of general relativity to allow for the continual creation of matter, but the rate that was involved was so low (about one particle per cubic kilometer per year) that it was not in conflict with experiment.[117]

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[114] As Stephen Hawking describes it: "Further evidence was provided by the so-called second law of thermodynamics, formulated by the German physicist Ludwig Boltzmann. It states that the total amount of disorder in the universe (which is measured by a quantity called entropy) always increases with time. This, like the argument about human progress, suggests that the universe can have been going only for a finite time. Otherwise, it would by now have degenerated into a state of complete disorder, in which everything would be at the same temperature" (*Black Holes and Baby Universes and Other Essays*, 1994, p. 87). According to John Ross of Harvard: "Ordinarily the second law is stated for isolated systems, but the second law applies equally well to open systems..." (*Chemical and Engineering News*, July 27, 1980, p. 40).

[115] Trumpler discovered the existence of interstellar dust and, after comparing the angular sizes and brightness of globular clusters, reasoned that the dust was absorbing radiation. He also found that distant star clusters were bigger than nearby clusters, and he postulated that this was due to interstellar dust, which absorbed radiation from the distant clusters and thus made them appear fainter and more distant. Dust grains absorb optical photons. The energy carried by those photons cannot vanish. Instead, it must heat the dust grains. Since grains are solid, then upon becoming heated they will radiate a blackbody spectrum. For typical grain sizes of a micron or so, and the observed spectrum of the interstellar radiation field, one can derive typical grain temperatures by applying Wein's law. The emission properties of grains determine the general chemical composition of the dust: Ices (water ice, CO_2, etc.), graphite, silicates, iron.

[116] Hermann Bondi, *Cosmology*, 1960, pp. 20-22.

[117] Stephen Hawking, *A Brief History of Time*, p. 47.

We note how Hawking shows no compunction for the fact that science was willing to modify one of its most sacrosanct theories (*i.e.*, General Relativity) to make room for Bondi's explanation for Olbers' Paradox.[118] It wasn't enough that no one had ever proved that energy could create matter, but now they were going to make sure that the factory never stopped producing it. None of this seems to bother Hawking, for, as he states: "the rate…was so low." This is the same sort of preferred logic that String Theorists use to explain why virtual particles, which are said to "pop in and out of existence," do not violate the First Law of Thermodynamics, that is, simply because they are "gone in a flash."[119]

Various modern cosmologists attempt to explain Olbers' paradox by asserting: (a) if the galaxies are receding from us, then much of their light is red-shifted and thus the energy of the light is undetectable; (b) if the universe was created in the Big Bang, the light from the most distant stars has not had enough time to reach us, and (c) the expansion of the universe will dissipate starlight. All these proposals, however, are based on question-begging speculations. First, there is no proof that galaxies are receding from us since redshift has not been proven to be a measure of either distance or velocity, and even if it were, how would one know that the light has been redshifted if the energy is "undetectable"? If it is undetectable (and thus produces a dark sky) this could just as well be the case because the energy does not exist. Second, it is illogical to argue that light from distant stars has not yet reached the Earth, since in an infinite universe there would be an infinite number of star generations, making an infinite amount of light in the universe. Third, an expanding universe cannot alter the first law of thermodynamics, which currently holds that energy can neither be created nor destroyed. If in some way starlight loses its energy, the energy still exists in another form and place, and it will find its way to Earth, nonetheless.[120] In the end, the infinite universe behaves precisely opposite to the way its inventors intended it to work.

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[118] "Modification" of the General Theory is quite a presumptuous undertaking by Hawking since it was Einstein who desired to solve Olber's paradox by General Relativity. As Clark writes: "The reasons for rejecting the Newtonian universe can be simply understood….For it seemed mathematically clear that the effect of an infinite number of stars would, even at infinite distances, produce an infinitely strong force whose effect would be to give the stars a high velocity through the universe….Einstein was therefore forced to consider whether it was possible to conceive of a universe that would contain a finite number of stars distributed equally through unbounded space. His answer to the apparent contradiction lay in the idea that matter itself produced the curvature of space" (*Einstein: The Life and Times*, pp. 267-268).

[119] The First Law of Thermodynamics previously held that neither matter nor energy can be created or destroyed, which has since eliminated matter from the Law.

Meanwhile, problems for the concept of an infinite universe were just beginning. Since, as noted above, an infinite universe would produce an infinite amount of electromagnetic radiation, then by the same principle the universe would produce an infinite amount of every other transmittable phenomenon of nature, including gravity. Gravity would be especially troublesome since no one could possibly suggest that its effects would be minimized by "absorption from cosmic dust." Gravity knows no barriers and has no limits. Ironically, Newton's attempt to save the collapse of the universe by proposing that it be infinite is the very thing that would cause it to collapse. Although this obvious bit of logic completely escaped the mind of Newton, scientists about two hundred years after him became very aware of the problem gravity presented, but didn't know quite what to do about it. Rather than abandon the infinite universe, they concocted "repulsive forces" by reworking Newton's equations so as to counteract the "infinite" force of gravity. Here we see the same fudging of numbers that Hawking's colleagues applied to Bondi's theory. In this case, the dubious distinction belongs to Hugo von Seeliger, J. C. Kapteyn and Carl Neumann. Current advocates of this cosmology, such as Andre Assis, seek, as he puts it, for

> …a universe that is boundless and infinite in space, which has always existed without any creation, and with an infinite amount of matter in all directions….it has no preferred center, so that any point can arbitrarily be chosen as its center,

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[120] Even those hoping for a resolution to Olber's paradox admit the poor history of its attempted resolutions, and specifically the dubiousness of the "expanding universe" solution. Paul Wesson states: "For most combinations of the cosmological model, galaxy formation redshift and galaxy evolution, the expansion only reduces the intensity by a factor of about 3-4…This confirms the conclusion drawn from earlier bolometric calculations of the extragalactic background light by Wesson, Valle, and Stabell, and shows Harrison is right about Olber's paradox. Contrary to what is implied in some books, the latter is not resolved mainly by the cosmological redshift. The darkness of intergalactic space is a result primarily of the finite age of the galaxies, in conjunction with other factors including the finite speed of light, and only secondarily of the expansion of the universe ("Olber's Paradox and the Spectral Intensity of the Extragalactic Background Light," *The Astrophysical Journal*, 367:399-406, February, 1991). We must add, however, that the "finite age of galaxies" would do little to solve the problem in a universe that continually made galaxies *ad infinitum*.

so that Newton's gravity "paradox is solved with the Seeliger-Neumann potential energy, even keeping an infinite and homogeneous universe."[121]

Einstein's Fudge Factor: The Cosmological Constant

During this time, of course, Einstein's vision of the universe held sway. Without repeating what we have already discovered about his bizarre universe, suffice it to say, it had its own set of paradoxes. Einstein's original formula kept the universe from collapsing (with a little help from the infamous fudge factor called the "cosmological constant"), but this solution was unstable, since the slightest imbalance in the constant would result in an expansion of the universe, which in turn would increase the repulsive force and decrease gravity, and thus increase the expansion exponentially. Conversely, the slightest contraction would result in a premature collapse of the universe. Interestingly enough, Nobel laureate Robert Laughlin explains the problems in terms of our old friend, ether:

> The closet of general relativity contains a horrible skeleton known as the cosmological constant. This is a correction to the Einstein field equations compatible with relativity and having the physical meaning of a uniform mass density of relativistic ether. Einstein originally set this constant to zero on the grounds that no such effect seemed to exist. The vacuum, as far as anyone knew, was really empty. He then gave it a small nonzero value in response to cosmological observations that seemed to indicate the opposite, and then later removed it again as the observations improved.[122]

Here we see that the "cosmological constant" was not merely some innocent mathematical figure. In short, Einstein was trapped like the proverbial rat in a corner. If he kept the cosmological constant at zero, his universe would be unstable. If he gave it a non zero value, he would have to admit the existence of ether – the very substance that was initially denied by his Special Theory of Relativity. Thanks to Laughlin's analysis we have been alerted to the connection. Perhaps this is the reason that in 1916, at just the time he was developing his General Theory of Relativity, Einstein suddenly had a new affection for ether possessing "physical properties." Laughlin reveals the inherent problems such theories will face:

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[121] Andre K. T. Assis, Relational Mechanics, 1999, pp. 94, 93. See also *The Milky Way Galaxy and Statistical Cosmology: 1890-1924*, Erich Robert Paul, 1993.

[122] Robert B. Laughlin, *A Different Universe*, p. 123.

> The view of space-time as a nonsubstance with substance-like properties is neither logical nor consistent. It is instead an ideology that grew out of old battles over the validity of relativity. At its core is the belief that the symmetry of relativity is different from all other symmetries in being absolute. It cannot be violated for any reason at any length scale, no matter how small….This belief may be correct, but it is an enormous speculative leap.[123]

This is certainly the irony of ironies. In order to exist, Relativity must function as an oxymoron – it must be absolute! This is the inevitable consequence of a theory that is erroneous from the start. Laughlin tries his best to save Relativity from its self-destruction, but as we will see, he can only appeal to mystery and ignorance as his cudgel:

> Despite its having become embedded in the discipline [of Relativity], the idea of absolute symmetry makes no sense. Symmetries are caused *by* things, not the cause *of* things. If relativity is *always* true, then there has to be an underlying reason. Attempts to evade this problem inevitably result in contradictions. Thus if we try to write down relativistic equations describing the spectroscopy of the vacuum, we discover that the equations are mathematical nonsense unless either relativity or gauge invariance, an equally important symmetry, is postulated to fail at extremely short distances. No workable fix to this problem has ever been discovered. String theory, originally invented for this purpose, has not succeeded. In addition to its legendary appetite for higher dimensions, it also has problems at short length scales, albeit more subtle ones, and has never been shown to evolve into the standard model at long length scales, as required for compatibility with experiment.[124]

Laughlin then enlightens us to a further anomaly and its accompanying coverup:

> Thus the innocent observation that the vacuum of space is empty is not innocent at all, but is instead compelling evidence that light and gravity are linked and probably both collective in nature. Real light, like real quantum-mechanical sound, differs

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[123] Robert B. Laughlin, *A Different Universe*, pp. 123-124.

[124] *Ibid.*, pp. 124-125.

> from its idealized Newtonian counterpart in containing energy even when it is stone cold. According to the principle of relativity, this energy should have generated mass, and this, in turn, should have generated gravity. We have no idea why it does not, so we deal with the problem the way a government might, namely by simply declaring empty space not to gravitate.[125]

As we can see, physicists were discovering that the mathematics that allowed them to toy with whatever universe their minds imagined was the same mathematics that made uncompromising demands they simply could not satisfy. As Hubble stated it:

> Such a universe, if it contains matter, will be unstable. At best it could be in unstable equilibrium, like a ball balanced on a point. The slightest disturbance would upset the balance – and internal disturbances evidently must occur. The universe would then revert to its natural state of either contraction or expansion….At this point the cosmologist seizes upon the observed red-shifts, interprets them as velocity-shifts, and presents them as viable evidence that the actual universe is now expanding, and expanding rapidly.[126]

In the 1920s Willem de Sitter and **Alexander Friedmann** attempted to find a solution to Einstein's problem, but after they reworked his equations, cosmology didn't know whether it was coming or going, literally and figuratively. De Sitter's modifications had it expanding, while Friedmann's had it contracting, and there was an infinity of possible outcomes between these two extremes depending on how one played with the numbers. Last but not least, General Relativity, as every Relativist must admit, invariably leads back to a "singularity."

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[125] *Ibid.*, p. 125. Laughlin adds: "The desire to explain away the gravity paradox microscopically is also the motivation for the invention of supersymmetry, a mathematical construction that assigns a special complementary partner to every known elementary particle. Were a superpartner ever discovered in nature, the hope for a reductionist explanation for the emptiness of space might be rekindled, but this has not happened, at least not yet" (*ibid*).

[126] *The Observational Approach to Cosmology*, pp. 54-55.

There is no escape from this conclusion, mathematically speaking. "Singularity" is the word modern cosmologists employ in order to cover up the fact that they have not the foggiest notion what happens when, according to the logical conclusions of Einstein's theory, all the matter and energy of the universe is sucked back up into the proverbial abyss. Whither it goes, or from whence it came, no one seems to know. Except for a few bold scientific entrepreneurs who don't mind running the risk of appearing mentally unbalanced by suggesting that "singularities" come from "other universes and dimensions," modern science is mute, and painfully so, not to mention the fact that these "other universes" would have the same problem of collapsing in on themselves as our universe.

The lesson to be learned here is that it is extremely dangerous to play with infinity. Anything that is posited as infinite outside of God always leads to absurdities. Physicists and mathematicians have become painfully aware of this intractable problem. The reason we hear talk of "parallel universes" and "alternate histories" from Hollywood's science fiction dramas is that these ideas have already been bandied about in scientific circles as the solutions to the perplexing problems in modern cosmology. Charles Seife, for example, has reasoned that if two premises are accepted: (a) infinite space, and (b) the second law of thermodynamics, then when the second law is applied to blackholes, it leads to a "holographic bound." This means that any portion of energy and matter enclosed in a finite sphere can be arranged in only a finite number of ways. Accordingly, if the universe is infinite, it means there must be an infinite number of ways to arrange energy and matter that are different than what appears in our little universe. This would inevitably lead to an infinite assortment of universes, with the haunting possibility that a whole host of them are presently mirroring your reading of this book. These imaginative solutions are inevitably created when men mistake the universe for their god.[127]

Edwin Hubble and Modern Cosmology's Wax Nose

Undaunted, the theorists marched onward. As we noted earlier, the main impetus for the expanding universe theory was **Edwin Hubble**, although the idea actually originated with Willem de Sitter. Hubble based his theory of expansion on the redshift of starlight. As we have cited earlier, although Hubble admitted to other viable interpretations of redshift, nevertheless, the interpretation the science establishment connects to Hubble is that redshift is caused by the stretching of the starlight's wavelength, a stretching that is said to be the result of the star's enormous recession speed away from the Earth. The faster the recession, the more the wavelength would be stretched, and thus, the larger the redshift and the further away the star was said to be. The calculation of its recession speed became known as Hubble's Law.

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[127] "Physics in the Twilight Zone," *Science*, 305:464, 2004.

Edwin Hubble (1889 – 1953)

To fit with the data he observed in 1929, Hubble figured that his "H" constant, which was the proportion between the speed of the galaxy compared to its distance away from us, would have to be 100 kilometers per second per megaparsec.[128] Thus, if a galaxy was said to be 10 megaparsecs away from us, Hubble's Law held that it must recede with a velocity of 1000 kilometers per second. If the galaxy were a gigaparsec from us (which is 1000 megaparsecs), it must recede with a velocity of 100,000 kilometers per second.

Why was Hubble's Law so important to modern cosmologists? With this law, one could calculate the rate of expansion, and once one knew the rate, one could then determine how long the expansion had been taking place and, therefore, determine when the universe began. If one could imagine the expansion being reversed until the universe went back to its original form, the Hubble Law could retroactively calculate the age of the universe. If scientists could make the age long enough, then there would be sufficient room to fit in both cosmic and biological evolution. Indeed, the stakes were certainly high.

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[128] A "megaparsec" equals 3.3×10^6 light years. A "light year" is the distance light travels in a year, at 300,000 kilometers per second, which equals 3×10^{19} kilometers. Edwin Hubble, "A Relation Between Distance and Radial Velocity Among Extra-Galactic Nebula," *Proceedings of the National Academy of Science*, 15, 1929, pp. 168-173. Edwin Hubble and Milton Humason, "The Velocity-Distance Relation Among Extra-Galactic Nebulae," *Astrophysical Journal*, 74, 1931.

Milton Humason (1891 – 1972)

The circumstances surrounding Hubble's interpretation of the redshift are intriguing. Hubble worked with Milton Humason, but only Hubble's name is associated with the redshift/expansion theory. The primary reason is that Humason was very reluctant to provide evidence for an expanding universe. The scientific community, based on Einstein's reworked mathematical formulas (courtesy of de Sitter and Friedmann), had already decided that the universe was expanding, but they were missing observational evidence. Consequently, the science community was predisposed to interpret redshift as a Doppler phenomenon wherein galaxies are understood to be moving away at great speeds from the observer.[129] This is in the face of the fact that there was no proof for a connection between receding galaxies and redshift, or that galaxies are receding at all, or that redshift is to be interpreted as a Doppler shift. In a paper published in 1931 Humason wrote:

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[129] A Doppler shift, as it is known in sound mechanics, is the expansion of sound's wavelength as the source of the sound recedes from you (or contraction as the source approaches you). We hear a rapid change in pitch, for example, when a speeding train blowing its whistle either approaches us or recedes from us. Many scientists today claim that the same thing happens to light when it travels, that is, those who believe light is a wave say that the wave expands as the source of light recedes from the observer. The principle of the lengthening or shortening of wavelength was first proposed by Johann Christian Doppler in 1842 but resisted by the science community for two decades. His findings were confined to sound waves. His theory was confirmed by the Dutch scientist C. H. D. Buijs-Ballot in 1845. In 1860 Ernst Mach proposed the Doppler effect was true for light waves,

> It is not at all certain that the large redshifts observed in the spectra are to be interpreted as a Doppler effect but, for convenience, they are interpreted in terms of velocity and referred to as apparent velocities.[130]

To refer to them as only "apparent" velocities means that Humason was not committing himself to the Friedmann-Lemaître-Einstein-de Sitter hypothesis. Hubble, of course, knew of Humason's doubts and makes reference to them: "But later, after the 'velocity-distance relation' had been formulated, and Humason's observations of faint nebulae began to accumulate, the earlier, complete certainty of the interpretation began to fade."[131] We might say that Humason paid a dear price for his non-conformance. Whereas in the early going, the discovery of the redshift/velocity ratio was attributed to "Hubble-Humason," later, when it was clear that Humason would be the first not to commit, his name was dropped, which is why the public only knows it as "Hubble's Law."

Interestingly enough, regardless of what the science establishment now associates exclusively with Edwin Hubble, the fact remains that even Hubble never fully committed himself to the now popular interpretation.

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which was tested by W. Huggins in 1868. It wasn't until 1901 that Russian scientist and editor of the *Astrophysical Journal*, Aristarkh Belopolsky, found the same effect in light waves, which was confirmed by J. Stark in 1905 and Quirino Majorana in 1918. One theory posits that redshift is caused by light's travel through an electron-positron net pervading all space (M. Simhony*, Invitation to the Natural Physics of Matter, Space, Radiation*, Singapore, New Jersey, World Scientific Publishing, 1994, p. 252; and John Kierein, "Implications of the Compton Effect Interpretation of the Redshift," *IEEE Trans. Plasma Science* 18, 61 (1990), et al.). In any case, it should be noted that the "Hubble Constant" has not been very constant. In 1926 it had a value of 500 km/sec/megaparsec. With several intermittent decreases, it now stands at 50.3 km/sec/megaparsec (Michael Rowan-Robinson, "Extragalactic Distance Scale," *Nature*, Dec. 16, 1976, vol. 264, p. 603).

[130] "Velocity-Distance Relation Among Extra-Gallactic Nebulae," *Astrophysical Journal*, 74, 1931. We even see Humason's reluctance positioned in the very title of another article containing the word "apparent": "The Apparent Radial Velocities of 100 Extra-Galactic Nebulae," *Astrophysical Journal*, 83, 1936. Humason held his ground even in the face of redshifts he found between 1931-1936 corresponding to 40,000 km/sec.

[131] *The Observational Approach to Cosmology*, p. 29.

Hubble was quite aware of what the science community desired, but maintained his distance. He writes:

> This explanation interprets redshifts as Doppler effects, that is to say, as velocity-shifts, indicating actual motion of recession. It may be stated with some confidence that redshifts are velocity-shifts or else they represent some hitherto unrecognized principle in physics…. Meanwhile, redshifts may be expressed on a scale of velocities as a matter of convenience. They behave as velocity-shifts behave and they are very simply represented on the same familiar scale, regardless of the ultimate interpretation. The term "apparent velocity" may be used in carefully considered statements, and the adjective always implied where it is omitted in general usage.[132]

Obviously, Hubble is making the same conclusion as Humason, that is, he was only committing to the idea of an "apparent velocity" of the galaxies, not an actual velocity. Confirming his meaning is a 1934 lecture in which Hubble cautioned:

> The field is new, but it offers rather definite prospects not only of testing the form of the velocity-distance relation beyond the reach of the spectrograph, but even of critically testing the very interpretation of redshifts as due to motion. With this possibility in view, the cautious observer refrains from committing himself to the present interpretation and prefers the colorless term "apparent velocity."[133]

This is especially significant since in Hubble's day an alternate explanation to redshift had not yet been postulated. Doppler shift was the only game in town, yet Hubble still was not committing himself to it. This skepticism is stated clearly in many works, but especially in the following:

> The investigations were designed to determine whether or not redshifts represent actual recession. In principle, the problem can be solved; a rapidly receding light source appears fainter than a similar but stationary source at the same momentary distance....

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[132] *The Realm of the Nebulae*, Yale Univ. Press, 1936, pp. 122-123. *The Observational Approach to Cosmology*, p. 22.

[133] 1934 lecture titled: "Redshifts in the Spectra of Nebulae," *The Halley Lecture*, May 8, 1934, Oxford: Clarendon Press, 1934, p. 14.

> For velocities of a few miles or a few hundred miles per second, the dimming factor is negligible. But for the extremely distant nebulae, where the apparent recessions reach tens of thousands of miles per second, the effects are large enough to be readily observed and measured. Hence, if the distances of the nebulae were known quite accurately we could measure their apparent faintness and tell at once whether or not they are receding at the rates indicated by redshifts.
>
> Unfortunately, the problem is not so simple. The only general criterion of great distances is the very apparent faintness of the nebulae which we wish to test. Therefore, the proposed test involves a vicious circle, and the dimming factor merely leads to an error in distance. However, a possible escape from the vicious circle is found in the following procedure. Since the intrinsic luminosities of nebulae are known, their apparent faintness furnishes two scales of distance, depending upon whether we assume the nebulae to be stationary or receding. If, then, we analyze our data, if we map the observable region, using first one scale and then the other, we may find that the wrong scale leads to contradictions or at least to grave difficulties. Such attempts have been made and one scale does lead to trouble. *It is the scale which includes the dimming factors of recession, which assumes that the universe is expanding.*[134]

As we have noted in our earlier discussion of Hubble, he then came to the place where he knew (considering what he actually saw in his telescope) that there were only two options left to him. He writes:

> Thus the use of dimming corrections leads to a particular kind of universe, but one which most students are likely to reject as highly improbable. Furthermore, the strange features of this universe are merely the dimming corrections expressed in different terms. Omit the dimming factors, and the oddities vanish. We are left with the simple, even familiar concept of a sensibly infinite universe. All the difficulties are transferred to the interpretation of redshifts which cannot then be the familiar velocity shifts….Meanwhile, on the basis of the evidence now

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[134] "The Interpretation of the Redshifts," pp. 108-109, in "The Problem of the Expanding Universe," *American Scientist*, Vol. 30, No. 2, April 1942, emphasis added.

> available, apparent discrepancies between theory and observation must be recognized. A choice is presented, as once before in the days of Copernicus, between a strangely small, finite universe and a sensibly infinite universe plus a new principle of nature.[135]

In his 1937 book, *The Observational Approach to Cosmology*, he is even more candid about his doubts regarding the interpretation of redshift, as well as his doubts about the Relativity theory behind it. He was honest enough to admit that there was another viable interpretation, and his book shows that he was deeply troubled by it, for he had no way to disprove it. It was the interpretation which holds that redshift, among other factors, may simply be due to light's energy loss as it collides or interacts with the mediums or debris in space. As Hubble puts the possibility:

> …light loses energy in proportion to the distance it travels through space. The law, in this form, sounds quite plausible. Internebular space, we believe, cannot be entirely empty. There must be a gravitational field through which the light-quanta travel for many millions of years before they reach the observer, and there may be some interaction between the quanta and the surrounding medium…. Light may lose energy during its journey through space, but if so, we do not yet know how the loss can be explained.[136]

The longer light must travel, the more it will interact with the particles of space and the more energy it will lose, and thus the longer will be its shift to the red end of the spectrum. Estimates say that light would lose about 5-7% of its energy every 109 light years of distance.[137] Hubble is so bothered by this possibility that he feels compelled to mention it about a dozen times throughout the book.[138]

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[135] Edwin Hubble, "The Problem of the Expanding Universe," *American Scientist*, Vol. 30, No. 2, April 1942, pp. 99f; *The Observational Approach to Cosmology*, p. 21. Hubble also states: "for a stationary universe, the law of redshifts is sensibly linear….The results may be stated simply. If the nebulae are stationary, the law of redshifts is sensibly linear; redshifts are a constant multiple of distances. In other words, each unit of light path contributes the same amount of redshift" (p. 111). Likewise, in a paper Hubble wrote with Richard Tolman in 1935, he concludes that the observational information is "not yet sufficient to permit a decision between recessional or other causes for the redshift" (Edwin Hubble and Richard Tolman, "Two Methods of Investigating the Nature of the Nebular Redshift," *Astrophysical Journal*, 82:302-37, 1935). Of the "two methods," of course, one is that redshift does not represent velocity.

[136] *The Observational Approach to Cosmology*, p. 30.

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[137] Fritz Zwicky was the first to propose the theory of "tired" light ("Redshift of Spectral Lines," *Proceedings of the National Academy of Sciences*, 1929, v. 15, pp. 773-779), but this was merely the default position for the fact that "Hubble has shown that the observational data which he has obtained do not agree satisfactorily with the homogeneous relativistic cosmological models [*viz.*, the Big Bang theory]" (Guy Omer, "A Nonhomogeneous Cosmological Model," 1949, p. 164). Among the many advocates of the "tired" light theory is the Ukrainian team of N. A. Zhuck, V. V. Moroz, A. A. Varaksin who, rejecting Big Bang cosmology due to the distribution and nature of the 23,760 quasars they examined, are forced to conclude that "the Cosmic Microwave Background Radiation can be either the remainder of the high temperature explosion of the super-dense substance *or the total radiation of all stars of the stationary universe with the said dissipation of the energy of light*." ("Quasars and the Large Scale Structure of the Universe," N. A. Zhuck, V. V. Moroz, A. A. Varaksin (*Spacetime and Substance, International Physical Journal*, Ukraine, Vol. 2, No. 5 (10) 2001, p. 193, emphasis added); and N. A. Zhuck in "The Microwave Background Radiation as aggregate radiation of all stars," XVII International Conference, April 12-14, 2000, Moscow (in Russian); and in *Spacetime and Substance* 1:1, 29-34 (2000). The same conclusion comes from Alex M. Chepick: "The urgency of "tired" light is proved for the stationary universe model and the value of energy loss of a photon on one cycle of light's wave is constant….The most surprising conclusion…is the value of energy loss of a photon on one cycle of light's wave is not dependent on a wavelength! Therefore it is a global physical constant….In a 1 meter vacuum a part of the energy loss of light makes $z = 10^{-27}$…because of equal contribution of electrical and magnetic components into the energy of the wave EMF, and that during one cycle there are 4 power transmissions between the electrical and magnetic fields, probably it is necessary to consider energy loss for each such transformation at $\varepsilon/4$." The writers also conclude: "The constancy of this loss suggests [the] existence of stable particles with approximately 10^{-69} kg [*i.e.*, mass of the photon] ("The Calculation of the Indispensable Accuracy of the Measuring of an EM's Wave Energy," *Spacetime and Substance*, Vol. 3, 2002, No. 3, 13, p. 111). See also Goldhaber and Nieto "New Geomagnetic Limit on the Mass of the Photon," *Physical Review Letters* 21:8, 1968, p. 567, which establishes a limit of 2.3×10^{-15} ev. Lakes, "Experimental limits on the Photon Mass and Cosmic Magnetic Vector Potential," *Physical Review Letters* 80:9, 1998, p. 1826. In 1981, David A. Hanes address the "tired light" issue in the article "Is the Universe Expanding?" (*Nature* 289:745). Other scientists who proposed the "tired light" theory were Max Born and Erwin Finlay-Freundlich but they never developed the theory. Paul LaViolette also advances the theory ("Is the Universe Really Expanding? *Astrophysical Journal*, 301, 544-553, 1986). Halton Arp holds "tired light" is discounted by the fact that no increase in redshift has been seen from light traveling through dense galactic material; that quasars close together can

Throughout the book we see Hubble struggling to make the data conform to the theories of the day. On the one hand, he knows that if he interprets redshift as a velocity-indicator, then he winds up with a universe that is too small and too young to accommodate the theory of biological evolution. As he puts it:

> A universe that has been expanding in this manner would be so extraordinarily young, the time-interval since the expansion began would be so brief, that suspicions are at once aroused concerning either the interpretation of redshifts as velocity-shifts or the cosmological theory in its present form.[139]

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have vastly different redshifts; that younger quasars have higher redshift; the Butcher-Oemler effect of galaxies of moderate redshift having blue and ultraviolet light; high redshift quasars in the middle of low redshift galaxies (*The Einstein Cross* – G2237+ 0305). Arp holds redshift is intrinsic to the object, and since each object is different because it is "created" at a different time, varying redshifts are produced (*Seeing Red*, pp. 97, 108, 159, 166, 173, 195).

[138] *The Observational Approach to Cosmology*, Oxford, 1937, Preface: "the phenomena of red-shifts whose significance is still uncertain"; p. 21: "the law of redshifts…but the uncertainties were considerable"; p. 26: "…red-shifts as velocity-shifts…seems to imply a strange and dubious universe, very young and very small…seems to imply that red-shifts are not primarily velocity-shifts…the observer is inclined to keep an open mind…"; p. 31: "Red-shifts are produced either in the nebulae, where the light originates, or in the intervening space through which the light travels….At present, however, the direct investigation ends in a vicious circle, and the persistent observer is forced to consider a possible indirect attack on the problem"; p. 39: "There seems to be no *a priori* necessity for a linear law of expansion, a strict proportionality between red-shifts and distance"; p. 43: "Thus, the familiar interpretation of red-shifts as velocity-shifts leads to strange and dubious conclusions; while the unknown, alternative interpretation leads to conclusions that seem plausible and even familiar"; p. 44: "The fundamental question is the interpretation of red-shifts"; p. 55: "At this point the cosmologist seizes upon the observed red-shifts, interprets them as velocity-shifts…" Radio astronomer, Grote Reber (d. 2002), who built the first radio telescope in 1937, points out many of these very pages in Hubble's book to indicate that Hubble had "grave doubts about redshifts being caused by relative motion." As noted previously, Reber is the true discoverer of the Cosmic Background Radiation, not Penzias and Wilson ("Cosmic Static at 144 meters wavelength," *Journal of the Franklin Institute*, vol. 285 (Jan. 1968), pp. 1-12). A biographical note reveals that Reber's mother was Edwin Hubble's seventh-grade teacher.

[139] *Ibid*., p. 46.

But if Hubble interprets redshift as a loss of light's energy, he has a more "plausible" model for redshift but one that produces an "indefinitely large" universe and, most of all, does not allow for the postulates of Special or General Relativity. As he puts it:

> On the other hand, if the recession factor is dropped, if red-shifts are not primarily velocity-shifts, the picture is simple and plausible. There is no evidence of expansion and no restriction of the time-scale, no trace of spatial curvature, and no limitation of spatial dimensions.[140]

What a dilemma for science! Hubble's only other alternative had already been discounted – an Earth-centered cosmos that was closed and finite. So what does a good scientist do in such a situation? He preserves the sacrosanct theory of General Relativity as best he can by making convenient *ad hoc* assumptions and creating arbitrary variables that will give it some semblance of respectability. The first assumption needed is that the universe is "homogeneous," that is:

> …there must be no favored location in the universe [*i.e.*, no central Earth], no center, no boundary; all must see the universe alike. And, in order to ensure this situation, the cosmologist postulates spatial isotropy and spatial homogeneity….[141]

Once "homogeneity" is assumed (not proven), one needs to get to an "expanding universe," for this will help support the trend in modern cosmology toward the Big Bang theory. But if one introduces expansion into a homogeneous universe, this will cause an imbalance in the "law of distribution" wherein, as Hubble warns his reader:

> …the density of the nebular distribution increases outwards, symmetrically in all directions, leaving the observer in a unique position. Such a favoured position, of course, is intolerable; moreover, it represents a discrepancy with the theory, because the theory postulates homogeneity. Therefore, in order to restore homogeneity, and to escape the horror of a unique position, the departures from uniformity, which are introduced by the recession factors, must be compensated by the second term

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[140] *Ibid.*, p. 63.
[141] *Ibid.*, p. 63.

> representing effects of spatial curvature. There seems to be no other escape.[142]

In other words, rather than the nebulae thinning out as the distance from their origin increases (as one would expect in an expanding universe), conversely, Hubble's telescope tells him that the distant nebulae have the same concentration as the nearer nebulae. So now Hubble needs to invent another variable that will compensate for this lack of thinning out. Hubble makes no excuses for the *ad hoc* nature of this seemingly desperate attempt to salvage modern theory. He writes:

> To the observer the procedure seems artificial…in testing the relativistic theory, he introduces a new postulate, namely recession of the nebulae, and it leads to discrepancies. Therefore, he adds still another postulate, namely, spatial curvature, in order to compensate the discrepancies introduced by the first.[143]

In other words, geodesic geometry is used to curve the space of the homogeneous universe so that it can bend to conform with the mathematics of General Relativity. As Hubble puts it:

> Theoretical investigators, guided by the assumption of homogeneity, adopt Riemannian geometry which operates in curved space. The curvature cannot be visualized….It is sufficient to say that the nature of the curvature is indicated, and the amount is measured, by the radius of curvature (which projects, as it were, to higher dimensions). The radius in our universe might be positive, negative or zero, and might be large or small. A positive curvature implies closed space, a universe with a definite, finite volume but with no boundary. A negative curvature implies open space, an infinite universe. The limiting case of zero curvature is 'flat' Euclidean space with an infinite radius…and, in all but flat space, the amount of curvature has a wide range of possible values.[144]

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[142] *Ibid.*, pp. 58-59. Hubble adds: "Observations demonstrate that: $\log_{10} N = 0.6m_c$ + constant. Relativistic cosmology requires that $\log_{10} N = 0.6(m_c - d\lambda/\lambda + C_v)$ + constant, therefore $C_v = d\lambda/\lambda$. The curvature of space is demonstrated and measured by the postulated recession of the nebulae." N = number of nebulae per square degree; m_c = the limiting faintness express as a magnitude; $d\lambda/\lambda$ = the recession factor; C_v is the effect of spatial curvature.

[143] *The Observational Approach to Cosmology*, p. 59.

[144] *The Observational Approach to Cosmology*, pp. 54-55.

But, even after admitting that his "theoretical investigators" produce such *ad hoc* solutions, nevertheless, in order to remain with the consensus, Hubble adds his own *ad hoc* touches to round out the picture:

> Actually, no curvature can be found which exactly compensates for the apparent departures from uniformity in each of the surveys. Nevertheless, if we admit the presence of rather considerable systematic errors in the observations, it is possible to select a curvature which will more or less restore homogeneity. Hidden errors of the necessary dimensions are by no means impossible in the very delicate investigations near the limits of a great telescope. Therefore the expanding universe can be saved by introducing a sufficient amount of spatial curvature.[145]

All in an effort to save the "expanding universe," Hubble is so desperate that, realizing even "curvature" cannot solve the problem, he proposes that perhaps there was an error in what he saw with his own eyes through his own telescope. He doesn't know for certain such error exists, but he depends on it nevertheless. This is quite ironic since Hubble's book is titled *The Observational Approach to Cosmology*, wherein the operative word is "Observational." In the end, Hubble's view is not about what Hubble "observes" but only what his philosophical presuppositions will allow him to believe. In the end Hubble makes a travesty of "observational" cosmology.

As far as modern science is concerned, Hubble remains somewhat of an enigma. Although he dismissed the viable Earth-centered solution for his "observations," his book leaves his colleagues with an equivocation that they would rather he not have said: "Two pictures of the universe are sharply drawn…*we seem to face, as once before in the days of Copernicus, a choice*…" The science establishment has made a concerted effort to ignore this equivocation, however. As they did in order to support Einstein's Relativity theory when, in 1919, the world's scientists promoted only one of Eddington's eclipse photographs (and ignored the rest) to show anyone who would believe them that light bent around the sun in accord with the predictions of General Relativity, so they ignore Hubble's alternate interpretation of redshift and cite only his initial paper of 1929, for it appears to be the only one that indicates redshift as the sole indicator of radial velocity. These unconscionable breeches of protocol are common in the science establishment. In most cases, only the evidence supporting the prevailing view will be published in the journals and popular books.

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[145] *The Observational Approach to Cosmology*, p. 60.

Allan Sandage, who is known for taking over the work of Hubble and who was dubbed by the *New York Times* as "the grand old man of cosmology," makes a concerted effort to give the impression that either Hubble made a mistake in doubting that redshift is a velocity indicator, or that he didn't mean what he wrote:

> We now come to one of the most remarkable episodes in all of science. Hubble's detailed analysis...is a most fascinating study of how an interpretation, without caution con-cerning possible systematic errors, led to a conclusion that the systematic redshift effect is probably not due to a true Friedmann-Lemaître expansion, but rather to an unknown, then as now, unidentified principle of nature. Indeed, even in the abstract to this 1936 paper on the *Effects of Redshift on the Distribution of Nebulae*, Hubble concluded: 'The high density suggests that the expanding models are a forced interpretation of the data.' His belief that the expansion probably is not real persisted even into his final 1953 paper which was the Darwin lecture of the RAS, given in May of the year he died in September. What were the steps leading to this conclusion that, in today's climate, seems so remarkable?[146]

It is "remarkable" to Sandage because he is the heir-apparent to Big Bang cosmology, and it is his job to make sure that Hubble's doubts about the redshift/velocity relationship are covered up. Sandage has made it quite clear that, opposed to Hubble, he is firmly committed to Big Bang expansion theory. In one popular venue Sandage says: "The expansion of the entire universe is the most important single hard scientific fact of cosmology,"[147] but, of course, it is not a "fact" at all, let alone a "hard" one. That Sandage is aware of Hubble's reluctance to interpret redshift as a function of velocity is freely admitted:

> Hubble concluded that his observed log *N(m)* distribution showed a large departure from Euclidean geometry, provided that the effect of redshifts on the apparent magnitudes was calculated as if the redshifts were due to a real expansion. A different correction is required if no motion exists, the redshifts

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[146] http://nedwww.ipac.caltech.edu/level5/Sandage2/ Sandage2_3.html).

[147] "Cosmology," *Hammond Barnhart Dictionary of Science*, Barnhart Books, 1986.

> then being due to an unknown cause. Hubble believed that his count data gave a more reasonable result concerning spatial curvature if the redshift correction was made assuming *no recession*. To the very end of his writings he maintained this position, favoring (or at the very least keeping open) the model where *no true expansion* exists, and therefore that the redshift "represents a hitherto unrecognized principle of nature." This viewpoint is emphasized *(a)* in *The Realm of the Nebulae*, *(b)* in his reply (Hubble 1937a) to the criticisms of the 1936 papers by Eddington and by McVittie, and *(c)* in his 1937 Rhodes Lectures published as *The Observational Approach to Cosmology* (Hubble 1937b). It also persists in his last published scientific paper which is an account of his Darwin Lecture (Hubble 1953).[148]

Not only was Hubble opposed to the "Friedmann-Lemaître expansion," but in the same 1936 paper he points to another target – General Relativity:

> …if redshifts are not primarily due to velocity shifts, the observable region loses much of its significance. The velocity-distance relation is linear; the distribution of nebulae [galaxies] is uniform; there is no evidence of expansion, no trace of curvature, no restriction of the time scale.[149]

The reader should stop and digest what an amazing statement this is. Without any equivocation, Hubble declares that, if he is correct that the redshift/velocity relationship is mistaken, Einstein's theory of Relativity is totally erroneous. Space "curvature" and "restriction of the time scale" were Relativity's basic tenets. Without them, there is no Relativity. No wonder Sandage does his best to silence Hubble's doubts. Without the relation between redshift and velocity, Einstein has become worse than the medievals he accused of practicing superstition.

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[148] Allan Sandage, *Journal of the Royal Astronomical Society of Canada*, Vol. 83, No. 6, Dec. 1989.

[149] *Astrophysical Journal* 84, 517 (1936), p. 553; and *The Observational Approach to Cosmology*, p. 63. Hubble continues: "The unexpected and truly remarkable features are introduced by the *additional assumption that redshifts measure recession*. The velocity-distance relation deviates from linearity by the exact amount of the postulated recession. The distribution departs from uniformity by the exact amount of the recession. The departures are compensated by curvature, which is the exact equivalent of the recession. Unless the coincidences are evidence of an underlying necessary relation between the various factors, *they detract materially from the plausibility of the interpretation*, the small scale of the expanding model, both in space and time is a novelty, and as such will require rather decisive evidence for its acceptance" (emphasis added).

All in all, the importance of this cross-section of astrophysical theory cannot be underestimated due to the esteem Hubble enjoys as the world's greatest astronomer of the twentieth century. As Sandage says of Hubble: "His success was remarkable, and his proportionate influence nearly unparalleled in modern astronomy."[150] But as they did with Humason, so they did with Hubble. If a scientist does not support the *status quo*, he or she is ostracized or reinterpreted, and that is why hardly anyone in college physics classes knows of Hubble's alternatives or the grave problems he saw in the redshift/velocity relationship.

Irrespective of his quandary regarding whether redshift is related to velocity, Hubble's proposed age of the universe gave at least some semblance of a time-scale that would not force science to capitulate to the six-day creation of Genesis. In his 1953 George Darwin lecture he states:

> When no recession factors are included, the law will represent approximately a linear relation between redshifts and distance. When recession factors are included, the distance relation is...accelerated expansion... the age of the universe is likely to be between 3000 and 4000 million years, and thus comparable with the age of rock in the crust of the Earth.[151]

Although it is difficult to know from the syntax whether Hubble was basing the time-span of 3-4 billion years upon the inclusion or elimination of recession factors, nevertheless, he gives us only 3-4 billion years for the "age of the universe." Note that Hubble did not say "age of the Earth." This is what is known in cosmology as "Hubble time," since it was derived directly from Hubble's Law of Expansion, and it was only one of three dating methods used at that time, the other two being radiometric dating by isotope decay and the composition of stars.

Hubble's conclusions caused quite a problem. A universe that was expanding for only 3-4 billion years would mean that the Earth, which was understood to come long after the initial expansion, would not be old enough to match the evidence from the burgeoning field of radiometrics that the Earth itself had to be at least 3-4 billion years old, which would require the universe to be much older. "Hubble time," of course, was far lower than that allowed by radiometric dating or star composition. In fact, even though Sandage claims that Hubble's 3-4 billion year time-span is based on "no recession factor" (and, therefore, Hubble's time-span would be higher if a recession were included), nevertheless admits:

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[150] Allan Sandage, *Journal of the Royal Astronomical Society of Canada*, Vol. 83, No. 6, Dec. 1989.

[151] "The Law of Redshifts," George Darwin Lecture, May 1953, *Royal Astronomical Society*, 113, 658. Allan Sandage claims that the sentence "the age of the universe is likely to be between 3000 and 4000 million years" refers to the fact that "no recession factor is included," but this cannot be proven based on the syntax of Hubble's paragraph.

> There was, of course, the embarrassment that the inverse of the Hubble expansion rate (*i.e.,* the Hubble time) was only two billion years on Hubble's 1930 to 1953 distance scale whereas the Earth was believed to be a bit older than three billion years even in 1936. It was left to the inventors of the steady state cosmology to emphasize this discrepancy of time scales, pointing out that any of the Friedmann models (*sans* cosmological constant) that were used to espouse a 'beginning' could not be true"[152]

Guy Omer had already pointed out these difficulties in the late 1940s. He writes:

> E. Hubble has shown that the observational data which he has obtained do not agree satisfactorily with the homogeneous relativistic cosmological models….The model has a short time scale. The present age of the model must be less than 1.2×10^9 [1.2 billion] years. This is about one-third the recent estimation of the age of the earth as an independent body, made by A. Holmes. This is probably the most serious difficulty of the homogeneous model. Because of the unrealistic aspects of the homogeneous relativistic model, Hubble proposed an alternate model which would be essentially static and homogeneous and in which the red shift would be produced by some unknown but nonrecessional mechanism.[153]

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[152] Allan Sandage, *Journal of the Royal Astronomical Society of Canada*, Vol. 83, No. 6, Dec. 1989.

[153] Guy C. Omer, Jr., "A Nonhomogeneous Cosmological Model," *Journal of the American Astronomical Society*, 109, 1949, pp. 164-165. Omer continues: "There have been several suggestions of possible mechanisms which would produce red shifts without having actual physical recession. As noted earlier, F. Zwicky [*Proceedings of the National Academy of Sciences*, 15, 773, 1929] has proposed that photons may lose energy with time, perhaps by a gravitational interaction

Since it was necessary to have the age of the Earth coincide with radiometrics, and since Hubble's law only provided half the needed age, various theories were proposed to bridge the gap so as to add the needed years to evolutionary theory. Hubble had already come across some ingenious solutions from his colleagues. He writes:

> Theories may be revised, new information may alter the complexion of things, but meanwhile we face a rather serious dilemma. Some there are who stoutly maintain that the Earth may well be older than the expansion of the universe. Others suggest that in those crowded, jostling yesterdays, the rhythm of events was faster than the rhythm of the spacious universe today; evolution then proceeded apace, and, into the faint surviving traces, we now misread the evidence of a great antiquity.[154]

But Hubble admitted that such excuses "…sound like special pleading, like forced solutions of the difficulty."[155]

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with the matter along their trajectories. R. C. Tolman [*Relativity, Thermodynamics, and Cosmology*, Oxford, Clarendon Press, 1934, pp. 285ff], however, has shown that 'gravitational drag' cannot account for the observed red shift if the relativity theory is valid. If the extragalactic red shift were produced by 'gravitational drag,' we should expect to measure red shifts within our own local group which would be greater than those indicated by Hubble's linear law, since the mean density of matter within the local group is greater than the average density of matter for the entire universe. If the photon's loss of energy were dependent upon time alone, we should expect to measure red shifts within our own local group which would be exactly equal to those predicted by Hubble's linear law." In order to save face for the theory, Hubble was ready to "suggest that the law of red shifts does not operate within the local group" (Omer, p. 166). The same difficulty arose: how to square this theory with evolution. Omer continues: "P. A. M. Dirac has proposed that the physical 'constants' are not constant with time but may vary in a systematic manner. This proposal would account for an observed red shift without any actual physical recession….E. Teller [*Physical Review*, 73, 801, 1948] has recently criticized Dirac's proposal, since there is considerable geological and biological evidence that the surface temperature of the earth has been reasonably constant for the last 5 × 10^8 years. With Dirac's hypothesis and the additional assumption that the masses of the earth and the sun have remained constant, Teller finds that the surface temperature of the earth would have been near the boiling-point for water within this time interval" (Omer, p. 166).

[154] *The Observational Approach to Cosmology*, p. 44.

[155] *Ibid.*

The Proposed Solutions of Lemaître, Eddington and Others

Fathe Georges Lemaître had quite a convenient explanation for Hubble's problem. In his model, the universe expands, but it reaches a point where the expansion slows down, at least long enough to allow the Earth to age sufficiently to match radiometric dating.[156] What causes this "slow down" is anyone's guess, for Lemaître gives his readers few clues.

Father Georges Lemaître (1894 – 1966)

Next in line was **Arthur Eddington**. As noted previously, he is a good example of how ideology rules science. Not liking Lemaître's concept of at least some beginning to the universe, Eddington writes: "Philosophically, the notion of a beginning of the present order of Nature is repugnant to me….I should like to find a genuine loophole."[157] Hence, as he did when he turned the inconclusive eclipse photographs into a conclusive support for General Relativity, Eddington shows that he is not above twisting the evidence to support his own philosophy. Nothing less than an infinite universe was on Eddington's agenda. By now we know the motivations for preferring an infinite universe – it needs no Creator, and thus there is no God to whom Eddington must answer.

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[156] Georges Lemaître, "A Homogeneous Universe of Constant Mass and Increasing Radius Accounting for the Radial Velocity of Extra-Galactic Nebulae," *Royal Astronomical Society*, 91, 1931, pp. 483ff, translated from the original French paper published in 1927.

[157] Eddington, "End of the World: From the Standpoint of Mathematical Physics," *Nature*, 127, 1931, p. 450.

Lemaître then continued the see-saw. Trying to pacify Eddington, Lemaître suggested that the universe evolved from a single, primeval atom. This would, he hoped, "be far enough from the present order of Nature to be not at all repugnant." He writes:

> We could conceive the beginning of the universe in the form of a unique atom, the atomic weight of which is the total mass of the universe. This highly unstable atom would divide in smaller and smaller atoms by a kind of super-radioactive process.[158]

Lemaître's view was eventually dubbed the "cosmic egg" theory, and eventually led to the concept of the "Big Bang," the popular term originally coined in jest by Sir Fred Hoyle. In essence, while Lemaître roosted on the "cosmic egg," **Arthur Eddington** advocated a "cosmic chicken," a universe that, as he desired, "allows evolution an infinite time to get started."[159] Hence, the question of which came first, the "cosmic egg" or the "cosmic chicken," would dictate the course of all the various theories of cosmology proposed in the twentieth century.

Lemaître, being a Catholic priest and thus committed to at least some semblance of exegetical logic, had his own problems, since the only "cosmic egg" to which Genesis gives any credence is the "Earth, without form and void" on the first day of creation. So if the Earth is the first thing in existence, then there cannot be a Big Bang. Consequently, any cosmological theory positing that the universe began with something other than the Earth has simply misinterpreted, ignored, or rejected, the words of inspired Scripture.

Unfortunately, many Catholic scholars were doing just that in the period Lemaître was writing. In the 1940s Fr. Pierre Tielhard de Chardin, a paleontologist, was adapting Lemaître's long-ages to his own theory which advocated the biological evolution of man.[160] Prior to Tielhard was George

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[158] Georges Lemaître, *The Primeval Atom: An Essay on Cosmogony*, trans. Betty and Serge Korff, 1950, pp. 99-100.

[159] Georges Lemaître, "On the Instability of Einstein's Spherical World," p. 672. See also "The Instability of the Einstein Universe," W. B. Bonnor, *Royal Astronomical Society*, December 9, 1954.

[160] *The Phenomenon of Man*, Harper & Row, 1975, revised English translation by Benjamin Wall. The Church refused to allow de Chardin to publish his books. In short, de Chardin ascribes all present turmoil in the world to the crisis or

Mivart in his 1871 book *On the Genesis of Species*,[161] which was followed by Fr. Ernest Messenger in his 1932 book, *Evolution and Theology: The Problem of Man's Origin*.[162] Suffice it to say that most of Catholic academia has capitulated to the Copernican, Evolutionary, Relativity model of cosmology and have thereby disowned their traditional heritage. De Chardin made an intimate connection between the fall of geocentrism and the rise of evolutionism:

> With the end of geocentrism, what was emerging was the evolutionist point of view. All that Galileo's judges could distinctly see as menaced was the miracle of Joshua. The fact was that in consequence the seeds of decomposition had been introduced into the whole of the Genesis theory of the fall: and we are only today beginning to appreciate the depth of the

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"phenomenon" which comes before every new mutation. He sees God as the Primal Impulse manifested in matter. From the Big Bang explosion that he believed occurred 20 billion years ago, de Chardin asserted that the "primal Creator" pressed into all matter, generating an ever greater spiritual consciousness, the final destiny being the "Omega Point" in which the divine impulse is perfectly manifested in all humanity. The knowledge needed to arrive at the Omega Point is preserved for future generations in the "noosphere," a collection of all the progressive thoughts of mankind. He writes: "the noosphere….Because it contains and engenders consciousness, space-time is necessarily *of a convergent nature.* Accordingly its enormous layers, followed in the right direction, must somewhere ahead become involuted to a point which we might call Omega, which fuses and consumes them integrally in itself..." (p. 259). Tielhard de Chardin became quite infamous in science circles when his forgery of Piltdown Man was exposed forty years after he introduced it as a missing-link.

[161] *On the Genesis of Species*, 1871. Mivart was a creationist early on, and later, while teaching at the University of Louvain, he became a theistic evolutionist. Mivart's thesis was that the statement in Genesis 1, "according to their kinds" referred to "species" in biological science. Theistic evolutionists were not accepted by the secular world, however. T. H. Huxley, for example, refuted Mivart's attempt at coinciding Genesis and evolution, as well as contesting Mivart's view that various Church Fathers and Scholastics, notably Francisco Suarez, could be interpreted as teaching the concept of evolution wherein one species gives rise to another. Huxley's motivation was to sever religion completely from science. At one point he stated that religion "could never lay its hands, could never touch, even with the tip of its finger, that dream with which our little life is rounded" (*Einstein: The Life and Times*, p. 503).

[162] *Evolution and Theology: The Problem of Man's Origin*, 1932. Messenger also translated Canon Henri de Dorlodot's book into English in 1922, under the title *Darwinism and Catholic Thought*. Also in this genre is Enrico Zoffoli's book *Cristianesimo: corso di teologia cattolica* (Udine: Edizioni Segno, 1994).

> changes which at that time were already potentially completed.[163]

The theories continued. Nothing short of a half-dozen other theories were proposed in the 1930s through 1950s. Prompted by Sir James Jeans' 1929 theory – a theory which held that, due to the time needed to break up star clusters, the universe was not billions, but trillions of years old, and that the universe is continually creating new matter which it obtains from other dimensions – the idea of an infinite universe was revived.[164] A universe with no beginning and no end would, in other words, produce a steady number of stars with unending births and evolutions. As one can surmise quite quickly, the goal of modern cosmology was to get to the point of making the Creator's presence superfluous, since matter was deemed quite capable of generating itself. Since distant galaxies appeared to be the same form, size and distribution as nearer galaxies, and yet were said to be part of an expanding universe, the only solution left was to claim that matter was filling the void by steadily and perpetually creating itself. As we noted earlier, this idea was eventually popularized by Hermann Bondi in 1960, and further promoted by Stephen Hawking. Both of these men have serious ideological motivations for their theories. Hawking, as we recall, made no apologies for allowing his personal philosophy to dictate his cosmological conclusions. He writes:

> However we are not able to make cosmological models without some admixture of ideology. In the earliest cosmologies, man placed himself in a commanding position at the center of the universe. Since the time of Copernicus we have been steadily demoted to a medium sized planet going round a medium sized star on the outer edge of a fairly average galaxy, which is itself simply one of a local group of galaxies. Indeed we are now so democratic that we would not claim that our position in space is specially distinguished in any way. We shall, following Bondi (1960), call this assumption the Copernican principle.[165]

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[163] Teilhard de Chardin, "Fall, Redemption and Geocentrism," in *Christianity and Evolution*, 1969, 1971, William Collins Co., Harcourt, p. 38.

[164] Jeans writes: "…matter can be continuously in the process of creation…stars and other astronomical bodies as passing in an endless steady stream from creation to extinction…with a new generation always ready to step into the place vacated by the old" (James Jeans, *Astronomy and Cosmogony*, 2nd ed, 1929, p. 421).

[165] Stephen Hawking and G. F. R. Ellis, *The Large Scale Structure of Space-Time*, 1973, p. 134.

Here we see the intimate connection between the theories of Bondi and Hawking, both of whom were eager to perpetuate the "Copernican Principle." Bondi made it clear that philosophical motivations were the impetus of his cosmological inventions in the following statement:

> …the problem of the origin of the universe, that is, the problem of creation, is brought within the scope of physical inquiry and is examined in detail instead of, as in other theories, being handed over to metaphysics.[166]

The Galaxy Formation Problem

As we have seen, modern astrophysics likes to keep its anomalies a well-kept secret. Here is another: it cannot explain the formation of galaxies. In 1975, James Binney informed us:

> The real problems of galaxy formation remain very much unsolved. The greatest difficulty is that we still have no idea what induced the formation of the first bound objects in an expanding universe."[167]

Ivan King stated that the problem was a "flagrant scandal that is rarely mentioned in public."[168] A recent study by Johns Hopkins University with a press release by Karl Glazebrook on July 7, 2004 stated:

> It seems that an unexpectedly large fraction of stars in big galaxies were already in place early in the universe's formation, and that challenges what we've believed. We thought massive galaxies came much later….This was the most comprehensive survey every done covering the bulk of the galaxies that represent conditions in the early universe. We expected to find basically zero massive galaxies beyond about 9 billion years ago, because theoretical models predict that massive galaxies form

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[166] Hermann Bondi, *Cosmology*, 2nd ed., Cambridge University Press, 1960, p. 140. Bondi had been advocating this view since 1948.

[167] *Nature*, 255:275-276, 1975; See also: J. Binney, 1981b, in *The Structure and Evolution of Normal Galaxies*, ed. S. M. Fall and D. Lynden-Bell, Cambridge: Cambridge Univ. Press. J. Binney, 1982b, *Annual Review of Astronomy and Astrophysics*, 20, 399.

[168] *The Evolution of Galaxies and Stellar Populations*, ed. B. M. Tinsley and R. B. Larson, New Haven: Yale University Observatory, 1977. Ivan R. King was professor of astronomy at the University of California, Berkeley.

> last. Instead, we found highly developed galaxies that just shouldn't have been there, but are."[169]

Sir Fred Hoyle, was also not shy divulging the philosophical basis for his cosmological views. In his partiality to the "steady state" theory, he revealed,

> [It] seemed attractive, especially when taken in conjunction with aesthetic objections to the creation of the universe in the remote past. For it seems against the spirit of scientific inquiry to regard observable effects as arising from "causes unknown to science," and this in principle is what creation-in-the-past implies.[170]

Eric Lerner says much the same, as quoted by Marcus Chown of *New Scientist*:

> Take the most distant galaxies ever spotted, for example. According to the accepted view, when we observe ultra-distant galaxies we should see them in their youth, full of stars not long spawned from gas clouds. This is because light from these faraway galaxies has taken billions of years to reach us, and so the galaxies must appear as they were shortly after the big bang. But there is a problem. "We don't see young galaxies," says Lerner. "We see old ones."

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[169] Alan M. MacRobert confirms the dilemma: "Astronomers thought they had a nice, clear picture of how galaxies formed billions of years ago – but now the picture is suddenly turning muddy. A team studying the faintest galaxies ever to have their spectra taken is finding far too many big, mature galaxies similar to our Milky Way much too early in cosmic history. 'Theorists are not yet at the point of panic, but they're getting there'" (*Sky and Telescope*, "Old Galaxies in the Young Universe," January 6, 2004). The BBC, in "Hubble's Deepest Shot is a Puzzle," reports of the 800 exposures in a patch of Hubble's Ultra Deep Field that there are far fewer stars existing than expected, stating that this "brings into question current ideas on cosmic evolution." Leader of the survey, Dr. Andrew Bunker, stated: "Another possibility is that physics was very different in the early Universe; our understanding of the recipe stars obey *when they form* is flawed" (BBC News, Sept. 23, 2004), emphasis added.

[170] Fred Hoyle, "A New Model for the Expanding Universe," *Royal Astronomical Society*, 108, 1948, p. 372. In his book, *The Nature of the Universe*, Oxford University Press, 1952, Hoyle admits: "there is a good deal of cosmology in the Bible…it is a remarkable conception," but concludes that Christianity is a "desperate attempt to find an escape from the truly dreadful situation in which we find ourselves…an eternity of frustration" (pp. 109-111).

> He cites recent observations of high-red-shift galaxies from NASA's Spitzer space telescope. A galaxy's red shift is a measure of how much the universe has expanded since it emitted its light. As the light travels through an expanding universe, its wavelength gets stretched, as if the light wave were drawn on a piece of elastic. The increase in wavelength corresponds to a shift towards the red end of the spectrum.
>
> The Spitzer galaxies have red shifts that correspond to a time when the universe was between about 600 million and 1 billion years old. Galaxies this young should be full of newborn stars that emit blue light because they are so hot. The galaxies should not contain many older stars that are cool and red. "But they do," says Lerner.
>
> Spitzer is the first telescope able to detect red stars in faraway galaxies because it is sensitive to infrared light. This means it can detect red light from stars in high-red-shift galaxies that has been pushed deep into the infrared during its journey to Earth. "It turns out these galaxies aren't young at all," says Lerner. "They have pretty much the same range of stars as present-day galaxies."
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> And that is bad news for the big bang. Among the stars in today's galaxies are red giants that have taken billions of years to burn all their hydrogen and reach this bloated phase. So the Spitzer observations suggest that some of the stars in ultra-distant galaxies are older than the galaxies themselves, which plunges the standard model of cosmology into crisis.[171]

By this time the reader should be able to see very clearly the driving force behind the inventions of these men. Their deep and uncompromising desire to safeguard Copernican cosmology could not be stated more forcefully. Apparently, they will say or do whatever it takes to remove Earth from the center of the universe. Of course, those of us on the other side know why: deep down, Hawking, Bondi, Hoyle, *et al.*, know that the Creator exists, but they choose to suppress that knowledge, and thus they concoct whatever cosmological theories they can in order to convince themselves, even if only temporarily, that not only does He not exist, but that He is not even needed.

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[171] Marcus Chown, "Did the big bang really happen," *New Scientist*, July 2, 2005, p. 2.

The self-creation of matter has been the underlying agenda of almost all of modern cosmology, but, of course, it is all a lie, and men are continually deceived by it. The reason the galaxies are fully formed and distributed non-randomly is simply because God created them all at the same time and placed them in their special positions in the universe. In reality, the most plausible explanation left to the scientist is that the galaxies were instantaneously formed whole and fully functional, for that is what the scientific evidence shows to us. But that solution, of course, is "unthinkable" to modern scientists. Accordingly, Isaiah can say:

> Lift up your eyes on high and see who has created these *stars*, the One who leads forth their host by number, He calls them all by name; because of the greatness of His might and the strength of *His* power, not one of them is missing.[172]

Simple physical laws preclude galaxies from existing for billions of years, since it is well documented that in spiral galaxies, for example, the dense cores rotate faster than the outer arms. As such, the arms would either become very twisted or eventually wrap around and fuse into the core in a very short time.[173] That the galaxies are presently in such pristine shape demonstrates they are indeed very young. Similarly, individual stars provide us with the same evidence. No one has ever found evidence of a star forming. Only exploding stars have been discovered. The same is true of stellar novas. They occur every 20-30 years when a star dies and becomes a super nova. However, there are fewer than 300 super nova rings (which are the remnants of the explosions) in the entire observable universe. If the universe is billions of years old, there should be literally millions of such rings. This evidence indicates that the stars were made fully formed in recent history and intermittently deteriorate by natural causes. As astronomer Gerardus Bouw notes:

> Evolutionary models have never been successful in accounting for the formation of a single star, let alone a whole galaxy or even a cluster of galaxies (Jones, B. J. T., 1976, *Review of Modern Physics*, 48:107). Virtually every model in vogue today, which attempts to account for such objects, assumes that they

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[172] Isaiah 40:26. Also, Psalm 147:4 [146:4]: "He counts the number of the stars; He gives names to all of them."

[173] *Physics of the Galaxy and Interstellar Matter*, 1987, pp. 352-413. *In the Beginning*, Walt Brown, pp. 23, 30.

> were formed from the collapse of certain density irregularities postulated to be present in the early stages of the Big Bang. Without such an assumption, the physics of collapsing gas clouds would not allow for the formation of objects even remotely resembling the major constituents of the universe. A number of explanations have been proposed to account for such density irregularities, including magneto-hydrodynamical "pinch" effects (Fennelly, A. J., 1980, *Physical Review Letters*, 44:955), but the existence of the required cosmic magnetic field is in doubt and the 3-degree Kelvin blackbody radiation reveals no evidence for any significant clumps of matter at the time believed to be about a million years into the evolution of the Big Bang.[174]

Additionally, if the galaxies are receding from us at the enormous speeds dictated by the Big Bang, then they should have broken their gravitational bonds long ago, and the farthest galaxies should be seen to have dissipated, but according to the above reports, such is not occurring. Big Bang cosmology attempts to answer this galactic anomaly with the forces of Dark Matter, claiming that the gravity of the latter is holding the former together, and that Dark Energy is propelling the Dark Matter. This, of course, is pure speculation since, with all the powerful telescopes available, no one has seen anything resembling Dark Matter or Dark Energy, and thus the science community has invented its convenient phantoms for themselves and the gullible public.

Gamow and the Birth of the Big Bang

George Gamow, the precursor to the modern idea of the Big Bang, was also a firm believer in the instantaneous and perpetual creation of matter. As he modeled his theory of the universe to coincide with his work in nuclear physics during the Manhattan Project, Gamow held that just as the atom bomb could create, in a millionth of a second, radioactive elements that were later found in the deserts of midwestern test sites, so too, the elements of the universe could have been created in a super explosion at the beginning of time. Gamow's theory was thunderously applauded by the scientific community, a community that was looking for anything to get them out of the dead ends left to them by de Sitter, Lemaître and Friedmann. Of course, Gamow did not have an explanation for how this super explosion originated, but that didn't really matter for as far as everyone was concerned, in this case the ends justified the means. Reminiscing about a conversation with Einstein, he writes:

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[174] *The Biblical Astronomer*, vol. 14, no. 110, p. 112.

> I remember that once, walking with him to the institute, I mentioned Pascual Jordan's idea of how a star can be created from nothing, since at the point zero its negative gravitational mass defect is numerically equal to its positive rest mass. Einstein stopped in his tracks, and, since we were crossing a street, several cars had to stop to avoid running us down."[175]

Indeed, the whole world has been stopped in its tracks because of the preposterous idea that matter creates itself. Matter has become the god of modern man, powerful enough to bring itself into being, evolve into stars and human beings, and continue on into eternity while watching its creatures die their hapless deaths.[176] As Carl Sagan preached:

> We are the local embodiment of a Cosmos grown to self-awareness. We have begun to contemplate our origins. We are star-stuff pondering the stars!… Our ancestors worshipped the Sun, and they were not that foolish. It makes sense to revere the Sun and the stars, for we are their children.[177]

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[175] G. Gamow, *My World Line*, 1970, p. 150.

[176] Some Big Bang theorists invoke the Heisenberg Uncertainty Principle to excuse themselves from having to explain the origin of matter. Since the Uncertainty Principle holds that a particle's position and momentum ($\Delta E\ \Delta t \leq h/2\pi$), or its energy and time ($\Delta x\ \Delta p \leq h/2\pi$), cannot be known, its advocates conclude that such limitations preclude the discovery of the origin of matter. This solution puts the cart before the horse, as it were, since the Heisenberg Uncertainty Principle was originally derived from the study of already existing matter and thus cannot be applied to pre-existing states. Moreover, the Uncertainty Principle allows for at least one of the needed components (*i.e.*, either position or momentum in $\Delta E\ \Delta t \leq h/2\pi$; or energy or time in $\Delta x\ \Delta p \leq h/2\pi$), thus forcing the theorists to choose at least one for the beginning of the Big Bang. But even if the Uncertainty Principle were invoked, the theorists must then confront the Entropy law, which holds that the initial explosion would tend to increasing disorder, not to the order we see today.

[177] Carl Sagan, *Cosmos*, 1980, p. 243.

After Gamow and company, more and more powerful telescopes were built. The universe Hubble saw in 1929 was being dwarfed by what men were discovering in the last half of the twentieth century (at least with the formulas they currently use to measure astral distances). The universe was no longer measured in megaparsecs but gigaparsecs.[178] But if one enforced the Doppler interpretation of redshifts on a universe that was gigaparsecs in size, Hubble's Law would be forced to say that the outer galaxies were receding from Earth faster than the speed of light. The very theory that gave them the expanding universe was now faced with a universe that was, as it were, too big for its britches, and which ends up contradicting Einstein's most cherished fact of life – the violation of *c in vacuo*.

So what did science do? Rather than face embarrassment by having to modify the foundation of its theory, it changed the "expanding" universe into an "exploding" universe, and thus the Big Bang concept was born – that primeval "point of singularity" infinitesimally smaller than the dot of the *i* on this page that, holding all the material of the universe, decided, for whatever reason, to explode about 13.7 billion years ago in a fraction of a second, and is still exploding, producing all that we see in the starry universe today and the recessional speeds to go along with them.[179] Here was the key ingredient: As it explodes it is said to "create space," and thus the galaxies are not receding faster than light, rather, space is created faster than light can travel, and the galaxies are merely being pulled along with the expansion so it only appears as if they are traveling faster than light. If one asks: "Where is the new space created during expansion?" theorists such as Misner, Thorne and Wheeler retort: "That is a meaningless question."[180] Once again, science pulled the proverbial rabbit out of the proverbial hat.

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[178] A gigaparsec is 1000 megaparsecs. 50 gigaparsecs equal 1.5×10^{11} light years, as opposed to one megaparsec, which equals 3.3×10^{6} light years.

[179] The theorists hold that the Big Bang started 13.5 billion years ago in the Planck dimensions from a volume of 10^{-40} cubic centimeters with a diameter of 3.14×10^{-13} centimeters, and was filled with particles of 1.62×10^{-33} centimeters packed solidly and having a density of 4.22×10^{93}, and a gravitational attraction between each particle of 1.3×10^{49} dynes (roughly 10^{46} greater than Earth's gravity). These theorists conveniently choose the Planck dimensions in order to avoid the infinite dimensions demanded by a singularity. The advocates postulate that a group of these Planck particles numbering 10^{60} spontaneously broke away, creating a hole of 3.14×10^{-13} centimeters in diameter but which was filled in 2×10^{-23} seconds. For some unexplained reason, the implosion does not reabsorb the 10^{60} particles (even though the gravitational attraction is immense), and the 10^{60} Planck particles do not remember that they are supposed to cease existing in 4×10^{-44} seconds but keep expanding into what we now have as the present universe (satirically described by G. Bouw in *The Biblical Astronomer*, vol. 12, no. 99, 2002 and vol. 13, no. 104).

The Anti-Big Bang Movement

Since the evolving Big Bang theory contains so many baseless assumptions, *ad hoc* assertions, and philosophical absurdities, it is hardly surprising to find opponents appearing frequently on the scene. For example, Tom Van Flandern remarks:

> The Big Bang…no longer makes testable predictions wherein proponents agree that a failure would falsify the hypothesis. Instead, the theory is continually amended to account for all new, unexpected discoveries. Indeed, many young scientists now think of this as a normal process in science! They forget, or were never taught, that a model has value only when it can predict new things that differentiate the model from chance and from other models before the new things are discovered. Explanations of new things are supposed to flow from the basic theory itself with, at most, an adjustable parameter or two, and not from add-on bits of new theory….Perhaps never in the history of science has so much quality evidence accumulated against a model so widely accepted within a field.[181]
>
> The Big Bang theory is the accepted model for the origin of the universe. This theory requires us to accept the following…that all the matter and energy in the entire universe were contained in an infinitesimal point at the "beginning"; that for some unknown reason it all exploded; that space and time themselves expanded out of that explosion; that at first space expanded faster than the speed of light; that the explosion was so uniform it emitted an almost perfectly uniform radiation everywhere; and the same explosion was non-uniform enough to create the observed, quite irregular matter distribution in the universe; that the chaos from the explosion eventually organized itself into the structures presently seen in the universe, contrary to the principle of entropy (which basically states that you shouldn't get order out of chaos); that all matter in the universe expands away from all

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[180] *Gravitation*, p. 739.

[181] T. Van Flandern, "The Top 30 Problems with the Big Bang," *Apeiron* 9, 2, April 2002.

> other matter as space itself continues to expand, although there is no center; that the expansion of space itself occurs between all galactic clusters and larger structures, but does not occur at all on scales as small as individual galaxies or the solar system; that vast assemblies of galaxies stream through space together relative to other assemblies; and that immense voids separate immense walls of galaxies, all condensed from the same explosion.[182]

When the Big Bang theory was in its infancy, the well-respected astronomer Robert Dicke offered this sobering assessment of its unlikelihood:

> The puzzle here is the following: how did the initial explosion become started with such precision, the outward radial motion became so finely adjusted as to enable the various parts of the Universe to fly apart while continuously slowing in the rate of expansion? There seems to be no fundamental theoretical reason for such a fine balance. If the fireball had expanded only 0.1 per cent faster, the present rate of expansion would have been 3×10^3 times as great. Had the initial expansion rate been 0.1 per cent less and the Universe would have expanded to only 3×10^{-6} of its present radius before collapsing. At this maximum radius the density of ordinary matter would have been 10^{-12} gm/cm^3, over 10^{16} times as great as the present mass density. No stars could have formed in such a Universe, for it would not have existed long enough to form stars.[183]

Of course, we must not hesitate to add that, as convincing as scientists ‘in the know’ can make the Big Bang appear, still, the alternatives offered by what are known as “dissident” astronomers and physicists are not really much better. We catch the alternative in Van Flandern's opening remarks of his critique: "This theory [the Big Bang] requires us to accept the following: time and space have not always existed; both began a finite time ago; and both the age and size of the universe are finite." What Van Flandern is pushing for, as are all the other "dissident" cosmologists such as Halton Arp, Eric Lerner, Michael Ibison, Hermann Bondi, Paul Marmet, Jayant Narlikar, Sisir Roy, and others, is "an evolving universe without beginning or end,"[184] a return to the "Steady-State" model, the same one proposed by Eddington, which Lemaître turned into the "cosmic egg."

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[182] Tom Van Flandern, *Dark Matter, Missing Planets and New Comets*, 1993, p. xvi. In another instance he adds: “…it should not be forgotten that it is not even certain that the universe is presently expanding (as opposed to contracting) even within the context of the Big Bang theory. Sumner has recently argued that the new space introduced by the expansion must dilute the permitivity of the vacuum, which in turn must alter the frequency of electrons around atoms. This affects observed redshift twice as strongly as the speed of expansion. When this consideration is factored into the equations, it turns out that the present universe is actually collapsing, not expanding, under Big Bang premises!” (*ibid.*, p. 400).

[183] Robert H. Dicke, *Gravitation and the Universe*, Jayne Lectures for 1969, American Philosophical Society, Independence Square, Philadelphia, 1970, p. 62.

But the infinite universe is an equally ridiculous concept. As we will see below, although it doesn't have the process problems of the Big Bang, it has origin problems, since it obviously has no origin. Except for God, anything that doesn't have an origin is a logical fallacy. Even God cannot create something infinite, for what is infinite is God. As we noted, beginning with Isaac Newton, there has been a war occurring in cosmological circles between the finite universe and the infinite universe, with no end in sight. Although both theories are wrong, at least the "cosmic egg" theory is a step closer to reality, since its foundation is that there was a "beginning" to it all. The biblical account tells us, however, that the primordial "egg" of the Big Bang was not a "singularity," but the Earth itself, called into being before any other heavenly body by the one who is Uncreated.

Redshift and the New Alternative

As we noted earlier, there is quite a divergence of opinion regarding the interpretation of redshift. The Big Bang theory says that we see a redshift in starlight because the light's wavelength is stretched. Longer waves produce a shift to the red end of the spectrum of white light. The light is stretched because, as other components of the Big Bang theory state, the stars are receding from the Earth at tremendous speeds, and therefore, when the light leaves from this rapidly moving star, since it must travel at the same speed, *c*, and cover the same distance over time, the only way to compensate for these factors is for the light to have a longer wavelength. This is almost common knowledge today.

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[184] So stated by Eric Lerner in "An Open Letter to the Scientific Community," *New Scientist*, May 22, 2004, p. 20, as he represents thirty-three other signers to the document. Lerner writes: "…the Big Bang is not the only framework available for understanding the history of the universe. Plasma cosmology and the steady-state model both hypothesize an evolving universe without beginning or end." Again on July 2, 2005, *New Scientist* quotes Lerner: "This isn't science. Big Bang predictions are consistently wrong and are being fixed after the event," the editor adding that "So much so, that today's 'standard model' of cosmology has become an ugly mishmash comprising the basic Big Bang theory, inflation and a generous helping of dark matter and dark energy" (Marcus Chown in "The End of the Beginning," *New Scientist*, July 2, 2005, p. 30). In his major work on the subject, Lerner adds: "If the Big Bang hypothesis is wrong, then the foundation of modern particle physics collapses and entirely new approaches are required. Indeed, particle physics also suffers from an increasing contradiction between theory and experiment" (Eric J. Lerner, *The Big Bang Never Happened*, 1991, p. 4).

What is not so commonly known but is vitally important for understanding why Big Bang theorists (besides their philosophical presuppositions) hold to such an exclusive interpretation of the redshift is that they are invariably advocates of Relativity theory, a theory positing that space is void, that is, it lacks any kind of material substance. Space, to the Relativist, is not an independent entity but is created and molded by gravitational pockets all over the universe. When space is so molded it is a vacuum (except, of course, for the matter that created it). As such, light traveling from a star has nothing physical with which to interact, and therefore nothing in space can interfere with the light as it travels. As far as Relativity is concerned, light is always traveling in a pristine environment in outer space, supposedly making its own electromagnetic medium as it travels. Hence, the only possible explanation for why redshift appears in starlight is that it is due to the motion of the star, specifically the supposed recession of the star away from Earth, *i.e.*, the expanding universe theory.

But the problem with the Big Bang's interpretation of the redshift is that it is not in the least supported by the hard data from observation. One of the Big Bang's chief opponents is astronomer Halton Arp. Although we must say at the outset that Arp's alternative "infinite" universe is also erroneous, nevertheless, we can use his vast research to show that the Big Bang's interpretation of redshift finds itself in the same unfortunate category.

Halton Arp was at one time an associate of Edwin Hubble, but as of this date he is the black sheep of the astrophysical community because, like Hubble and Humason, he dared to suggest an alternative to the expanding universe concept. Arp was systematically marginalized after his extensive work on the redshifts of quasars and galaxies indicated the universe was *not* expanding. As astrophysicist Jayant Narlikar writes:

> The ludicrous climax came about ten years ago when Arp was denied the use of telescopes in major observatories. The reason given was that his findings "did not make sense," and were therefore a "waste of time." In other words, telescopes are meant

> only to confirm the established ideas and not turn up anomalous data.[185]

The ostracizing of Arp and the ignoring of his evidence shows quite clearly the personal agendas and the ignorance abounding in the halls of science today. Regardless of whether Arp's interpretation of redshift is correct, it is quite clear that the science establishment is refusing to consider the evidence based upon its biased presuppositions and its desire to preserve the *status quo*. According to Arp, it is easy to figure out why:

> [I]f the cause of these redshifts is misunderstood, then distances can be wrong by factors of 10 to 100, and luminosities and masses will be wrong by factors up to 10,000. We would have a totally erroneous picture of extragalactic space, and be faced with one of the most embarrassing boondoggles in our intellectual history.[186]

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[185] *Times of India*, July 30, 1994. Astrophysicist Paul Marmet concurs: "Science is said to be about searching for truth, but the harsh reality is that those whose views clash with established theories often find themselves ridiculed and denied funds and publications." www.newton physics.on.ca. Arp writes in his new book, *Seeing Red*, concerning his first book, *Quasars, Redshifts and Controversies*: "…the book became a list of topics and objects to be avoided at all cost. Most professional astronomers had no intention of reading about things that were contrary to what they knew to be correct. Their interest usually reached only as far as using the library copy to see if their name was in the index….More than 10 years have passed and, in spite of determined opposition, I believe the observational evidence has become overwhelming, and the Big Bang has in reality been toppled" (*Seeing Red: Redshifts, Cosmology and Academic Science*, Montreal, *Apeiron*, 1998, pp. i, ii).

[186] *Seeing Red*, p. 1.

Just as physicists in 1887 looked for a way to escape from the "embarrassing boondoggle" looming behind the Michelson-Morley experiment (by which, if Relativity had not come along as the remedy, everyone would be back to a pre-Copernican cosmos), so today cosmologists are looking for a savior to relieve them of having to accept a smaller universe. As we noted earlier, one candidate for their salvation is Dark Matter, and its companion, Dark Energy. No one has ever seen either of these constituents, but the Big Bang theory says they are there, nevertheless.

Throughout his book Arp uses detailed observational evidence to show why the Big Bang interpretation of redshift is erroneous. From an analysis of X-ray sources, Seyfert Galaxies, Companion Galaxies, individual stars in the same galaxy, clusters of galaxies, and a critique of the so-called "gravitational lensing" effect, Arp makes quite a convincing case. His alternate view postulates that:

> On the theoretical front it has become more persuasive that particle masses determine intrinsic redshifts and that these change with cosmic age. Therefore episodic creation of matter will imprint redshift steps on objects created at different epochs. In addition it appears increasingly useful to view particle masses to be communicated by wave-like carriers in a Machian universe.[187]

Thus, Arp postulates that redshift is an indication of age, wherein newly "created" objects will have a higher redshift. But it appears that Arp is making the same assumption regarding Carl Anderson's 1932 discovery of the positron that Big Bang theorists made. In fact, Arp refers to the very process of electron-positron creation.[188] This view, of course, has a very difficult time preserving the First Law of Thermodynamics. Suffice it to say, there is a mixing and matching of various theories and observations in astrophysics today because, basically, no one really knows what is going on in the universe. As we noted earlier from astronomer Fred Hoyle: “The whole history of science shows that each generation finds the universe to be stranger than the preceding generation ever conceived it to be.”[189]

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[187] *Seeing Red: Redshifts, Cosmology and Academic Science*, p. 195. He adds: "In 1993, Jayant Narlikar and I had published a paper outlining how newly created matter would have a high redshift, and demonstrated how to account quantitatively for quasar and galaxy redshifts as a function of their age" (*ibid*., p. 137).

[188] He writes: "As for the creation of matter from a zero mass state [Arp's view], it is often objected that pair *creation* of electrons and positrons from photons in terrestrial laboratories does not produce low-mass electrons. The answer must be that these photons are localized packets of energy and the *created* electrons and positrons are local entities – not drawn from elsewhere in the universe" (*ibid*., p. 234); Arp also refers to the decay of the "Planck particle" as another source of the creation of matter: "Also in 1993, however, Fred Hoyle, Geoffrey Burbidge and Jayant Narlikar introduced the quasi-steady state cosmology (QSSC). There they

Accordingly, Arp holds that the “tired light” theory for redshift is discounted by the fact that: (a) no increase in redshift has been seen from light traveling through dense galactic material; (b) that some quasars which are close together have vastly different redshifts; (c) that younger quasars have higher redshifts; (d) that the Butcher-Oemler effect shows galaxies of moderate redshift have blue and ultraviolet light; and (e) that high redshift quasars are often in the middle of low redshift galaxies (*e.g.*, *The Einstein Cross* – G2237+ 0305).[190]

Irrespective of his alternate theory, the fact is that Arp still believes in a “much older, larger universe,”[191] and, as noted, supports his new method for his preferred cosmogony by appealing to the “creation” of matter. He believes his theory is correct because he simply has no other explanation for the origin of matter in his infinite universe, and thus, he has no qualms positing that the universe continues what it has been doing for eternity,

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created the matter in the form of Planck particles. The mass of the present day Planck particle is about 10^{19} GeV/c^2. In the short time scale of about 10^{-43} seconds the particle is unstable and decays into baryons and mesons…the Planck particle is *created* in the Quantum Gravity era…” (*ibid*., pp. 137-138, emphasis added); “It is natural to think of the ‘material vacuum’ or the ‘zero point energy field’ as possible thermalizing components in intergalactic space. This is simply saying that there is no such thing as empty space – that it contains at least some electromagnetic field and possibly quantum creation and annihilation and/or virtual particles. For example, newly created low mass electrons would be extremely efficient radiation thermalizers” (*ibid*., p. 237).

[189] Fred Hoyle, *Astronomy and Cosmology*, 1975, p. 48.

[190] Ya. B. Zel’dovich adds: “If the energy loss is caused by an interaction with the intergalactic matter, it is accompanied by a transfer of momentum; that is, there is a change of the direction of motion of the photon. There would then be a smearing out of images; a distant star would be seen as a disc, not a point, and that is not what is observed….if the decay of photons is possible at all, those in radio waves must decay especially rapidly! This would mean that the Maxwell equation for a static electric field would have to be changed….There is no experimental indication of such effects: the radio-frequency radiation from distant sources is transmitted to us not a bit more poorly than visible light, and the red shift measured in different parts of the spectrum is exactly the same…” (Misner, Thorne and Wheeler, *Gravitation*, p. 775).

[191] *Seeing Red*, p. 8.

that is, creating matter all by itself. Hence, not only is Arp's concept just as speculative and bizarre as that of the Big Bang theorists whom he critiques, he is also positioning himself against the biblical perspective since Holy Writ assures us that matter was called into being by its Creator; that creation was limited to six days, and that the appearance of inorganic matter in the cosmos was completed on the Fourth of the days of creation.

Further, as much as Arp is against Big Bang cosmologists, he is a firm supporter of Relativity theory and the Copernican universe, since he makes it quite evident that he refuses to interpret the periodicity of redshift as an indicator of the centrality of Earth. Arp writes:

> For supposed recession velocities of quasars, to measure equal steps in all directions in the sky means we are at the center of a series of explosions. *This is an anti-Copernican embarrassment.* So a simple glance at the evidence discussed in this Chapter shows that extragalactic redshifts, in general, cannot be velocities. Hence the whole foundation of extragalactic astronomy and Big Bang theory is swept away.[192]

Note how Arp assumes as his foundational truth that Earth is *not* in the center of the universe and, in fact, he uses this premise as a goad to embarrass the Big Bang theorists. In fact, we might say that Arp's alternative hypothesis regarding redshift is for the express purpose of trying to solve the Copernican dilemma created by the Big Bang. Unfortunately for Arp, the reality is that he is in the same dilemma as the Big Bang theorists he critiques.

The Use and Abuse of Stellar Parallax

Regarding the size and limits of the universe, if there is one cosmological phenomenon that has been consistently advocated as the vindicator of heliocentrism, it is stellar parallax. Science books by the hundreds have declared that Frederich Bessel finally discovered heliocentrism's long-awaited proof when, in 1838, he observed a slight shift in the position of a nearby star (Cygnus 61) against the background of a more distant star. Copernican astronomers continue to praise Bessel, but invariably they do so without either the slightest indication that parallax does not prove heliocentrism or any admission that there is a perfectly good alternative which allows one to interpret parallax from a geocentric perspective. For example, Alan Hirshfeld, writing one of the more recent books on parallax, attempts to convince his reader that parallax is the last word of the heliocentric/geocentric debate:

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[192] *Seeing Red*, p. 195, emphasis added.

> In Newton's day, the Ptolemaic system and the Keplerian version of the Copernican system were taught side by side in the universities of the world. But the pendulum of belief had swung irreversibly to the Copernican side. In the minds of most scientists, the heliocentric universe had become fact…Yet there remained a crucial missing element in what was otherwise a complete and compelling picture of the universe: *Not one shred of indisputable observational proof existed that the Earth moved through space*. Here then was the holy grail of many an astronomer. To prove that the Earth in fact revolved in a wide orbit around the Sun, the parallax of just one star – any star – had to be detected. The hunt for stellar parallax was on.[193]

Before we get into Hirshfeld's analysis of parallax, we pause to note his revelation concerning how heliocentrism was accepted. Hirshfeld admits that even prior to the discovery of what he deems as "indisputable observational proof," modern science had already accepted heliocentrism as a "fact." One wonders why this glaring anachronism that puts "fact" before "indisputable observational proof" doesn't cause Hirshfeld any concern, but there it is nonetheless. Of course, Hirshfeld's attempt to put fact before proof will become even more egregious when we show that not even parallax offers the "indisputable observational proof" that he is seeking. If Hirshfeld is ignorant of the inability of parallax to prove heliocentrism, then it shows how badly he and the modern scientific community he represents are out of touch with reality. In effect, Hirshfeld's anachronism gives us a clear example of the underlying bias in the Copernican establishment, for it demonstrates quite handily that it was not by any fact of science that heliocentrism reached acceptance, but only because "most scientists" had already made up their minds based on little more than their philosophical preferences.

How Parallax Measures Distance

First, we will investigate a little history about parallax measurements. Parallaxes have been measured for thousands of stars. For only about 700 stars, however, are the parallaxes large enough to be measured with a precision of 10 percent or better. Of those 700 stars, most of the ones within 20 parsecs from Earth are invisible to the unaided eye and are intrinsically less luminous than our sun. The vast majority of all known stars are too distant for their parallaxes to be measured, so that scientists must resort to non-empirical methods. Most of these methods are either statistical or indirect.[194]

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[193] Alan Hirshfeld, *The Race to Measure the Cosmos*, 2001, p. 47, emphasis added.

With the advent of the Hipparcos satellite launched in 1989 by the European Space Agency, its telescopes gathered 3.5 years worth of data on stellar positions and magnitudes, which were eventually published in 1997. Viewing the stars through two telescopes 58 degrees apart, Hipparcos measured the parallax of 118,000 selected stars within an accuracy of 0.001 seconds of arc. This accuracy is comparable to viewing a baseball in Los Angeles from a telescope in New York. Another mission, named Tycho (after Tycho de Brahe) measured the parallax of a million stars, but only to an accuracy of 0.01 seconds of arc.

As accurate as these measurements appear to be, the reality is, beyond 100 light years, it is hardly possible to measure an accurate parallax. Even within 20 light-years, parallax measurements are accurate only to within one light-year. At 50 light-years from Earth the error could be as high as 5-10 light-years in distance. All in all, within a 10% margin of error, Hipparcos measured the parallaxes of about 28,000 stars of up to 300 light-years from Earth. For any star beyond 300 light years, scientists are forced to estimate its distance from Earth by other means, none of which are proven methods of measurement (*e.g.*, redshift).[195]

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[194] George Abell, *Exploration of the Universe*, 1969, pp. 377-378.

[195] Other methods of determining parallax include: Photometric parallaxes, which are found by estimating a star's absolute magnitude (M) based on a spectral classification, and comparing that with its apparent magnitude (m). Statistical parallaxes could perhaps extend to 500 parsecs, but this only applies to groups of stars, not individual stars. Overall, of the half dozen or so methods employed today to measure astral distances, none of them are indisputable (including distances measured by redshift, Cepheid variables, luminosity, color of stars, etc.). There is only one purely empirical method, parallax (and its attendant modifications such as Spectroscopic, Moving Cluster Method, and Statistical Method), but it is quite limited in its applicability, since it can accurately measure only a thousand or so stars. In effect, modern science is left without an irrefutable means to measure cosmological distances, and thus all the literature espousing that stars, galaxies or quasars are billions of light years away from Earth is an unproven scientific assertion. Using Cepheid variables, for example, is certainly a question-begging venture, since Cepheids are too far away to be measured by parallax and, thus, depends on an unproven statistical method to measure distance. Other methods such as Secular Parallax, Expansion Parallax, Kinematic Distance, Light Echo Distance, Baade-Wesselink Method, Expanding Photosphere Method,

To understand how parallax is formed, in front of your face, place your finger from your right hand at arms length and align it with a finger from your left hand at half an arm's length. Observe your fingers first with your right eye open and then with your left eye open. As you switch your vision from one eye to the other, the nearer finger will appear to shift to the right.

In the heliocentric system, parallax is said to occur when, on one side of the Earth's orbit, say January 1, two stars are viewed at the same time in a telescope, one star near us and the other star far away (at least by conventional means to measure star distances). Let's say that the two stars we view on January 1 are aligned vertically in the same plane, that is, one star is at a higher position in our telescope lens than the other but both are on the same vertical line. Six months pass and we look at the same two stars on July 1. If parallax is demonstrated, we will see that the stars are not in a vertical alignment any longer. Assuming the Earth has orbited in a counterclockwise direction, the nearer star appears to have shifted to the right. This is due to the fact that, in the interval of six months, one has looked at the two stars from two separate locations that are 185 million miles apart (the diameter of the Earth's orbit). Since astronomers can now detect stellar parallax among a select few stars, they are predisposed to allowing the Copernican worldview to interpret the phenomenon as proof for the Earth's movement around the sun.

What most people do not know (and what most scientists keep from them) is that in the geocentric system the same optical phenomenon can be demonstrated. In the geocentric system, the stars are centered on the sun, (which is also true in the heliocentric system). The only difference, of course, is that in the geocentric system the Earth is fixed in space while the sun and stars revolve counterclockwise around the Earth. On January 1 we will notice that the two stars from our above example are in vertical alignment. When we look at these same two stars again on July 1 as the sun and stars have traveled halfway across the sky, the nearer star will appear to have shifted to the right of the farther star, at the same precise angle as in the heliocentric model. (To see animation of parallax from both a heliocentric and geocentric system, go to the menu button on the compact disc).

This equivalence of the geocentric parallax to the heliocentric parallax is nothing out of the ordinary. Based on geometrical reciprocity, the two

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Main Sequence Fitting, RR Lyrae Distance and about a dozen or so other methods have been proposed for measuring star distances, each with their own problems and uncertainties, and all of which makes one reflect on the veracity of Jeremiah 31:37: "Thus says the Lord: "If the heavens above can be measured, and the foundations of the earth below can be explored, then I will cast off all the descendants of Israel for all that they have done, says the Lord."

systems must be equal on all counts. The only difference is that in the heliocentric model the Earth is moving and the stars are fixed, while in the geocentric model the Earth is fixed and the stars are moving. What is out of the ordinary, however, is that the natural equivalence between the two systems has been systematically suppressed out of almost every science book written since the days of Newton, yet it is as simple and natural as the symmetry between one's right hand and left hand. By the mere fact of the equivalence, parallax does not prove heliocentrism. It only proves that there is an annual shift between the Earth and the stars. Rather, history shows that the phenomenon of parallax only proves there has been a rush to judgment in favor of heliocentrism that was based on nothing more than preference, not scientific fact.

The Neo-Tychonic Model

One stumbling block toward understanding the equivalence between the heliocentric and geocentric concepts of parallax is that the original model of geocentrism advocated by Tycho Brahe did not have the stars centered on the sun; they were centered on the Earth. That being the case, no parallax would be detected, at least based on the above mechanics and geometric proportions. That is, the stars would be in the same vertical alignment when one looked at them six months apart. Perhaps no one in Bessel's day realized that the only thing required to bring the geocentric model into conformity with the results of heliocentric model was to shift the center of the stars from the Earth to the sun. Consequently, the geocentric model that had the stars centered on the sun never gained its rightful place in the halls of astronomy. Tycho Brahe had not presented such a model because in his day (1546-1601) no one had yet discovered a stellar parallax, and, in fact, this lacuna in the astronomical evidence was one of the arguments Tycho used to discredit heliocentrism. As it stands now, however, unless some astronomical proof is forthcoming that demonstrates that the stars are not centered on the sun (which is virtually impossible to do based on observation), then geocentrism has the same mechanical answer to the phenomenon of parallax as the heliocentric model. All that is needed is a slight modification to the original Tychonic model, which most geocentrists know as the modified or neo-Tychonic model.

The neo-Tychonic model has been known to modern astronomy for quite some time and is still mentioned in some circles. For example, at the department of physics at the University of Illinois, one class lecture states:

> It is often said that Tycho's model implies the absence of parallax, and that Copernicus' requires parallax. However, it would not be a major conceptual change to have the stars orbit the sun (like the planets) for Tycho, which would give the same yearly shifts in their apparent positions as parallax gives. Thus if parallax were observed, a flexible Tychonean could adjust the theory to account for it, without undue complexity. What if parallax were not observed? For Copernicus, one only requires that the stars be far enough away for the parallax to be unmeasurable. Therefore the presence or absence of parallax doesn't force the choice of one type of model over the other. If different stars were to show different amounts of parallax, that would rule out the possibility of them all being on one sphere, but still not really decide between Tycho and Copernicus.[196]

The same course material adds the following conclusion:

> In fact, if we don't worry about the distant stars, these two models describe identical relative motions of all the objects in the solar system. So the role of observation is not as direct as you might have guessed. There is no bare observation that can distinguish whether Tycho (taken broadly) or Copernicus (taken broadly) is right.[197]

Some geocentrists, although seeing the merits of the neo-Tychonic model, still prefer to find a solution by retaining the Earth as the center of the orbit of the stars. They prefer this model because they assume Scripture puts Earth at the exact center of the circling stars. If this is a correct understanding of the relationship between the stars and the Earth, it will require an entirely different explanation for stellar parallax. The proposed explanation is that the light from the two stars will be distorted by its movement through the cosmic medium, and/or distorted by the sun's gravitational pull on the light. Since one star is farther away from the other, the amount of distortion between them will be proportionally different, and thus one star will be shifted against the other. The ray of light, as it were, is moved out of its normal path into a slightly different path before it reaches our telescope. This is very similar to the concept of stellar aberration that we analyzed earlier concerning James Bradley's discovery in 1728 of the ellipse formed over a period of a year by the star *Gamma Draconis*. In that case either the light from *Gamma Draconis* was shifted due to the finite speed of light having to travel such a great distance, or because the light is affected by the medium due to its long journey. As such, stellar aberration and parallax are the same phenomenon in the unmodified Tychonic model, whereas in the neo-Tychonic model, they are distinct.[198]

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[196] University of Illinois, Physics 319, Spring 2004, Lecture 03, p. 8. In the last few years the same explanation for parallax has been promoted by astronomer Gerardus Bouw. He has also coined the term "modified Tychonic model" (*Geocentricity*, Association for Biblical Astronomy, Cleveland, 1992, p. 232).

[197] University of Illinois, Physics 319, Spring 2004, Lecture 03, p. 8.

All things being equal, the neo-Tychonic model is the simplest explanation of geocentric parallax, and consequently, as Bradley found, stellar aberration would be a different phenomenon than stellar parallax. Not only is the neo-Tychonic model a more sound explanation of parallax with respect to the geometry (for it is simply a mirror image of the heliocentric model), but also because it is able to incorporate the vast distances to the stars, if, indeed, it is a fact that the stars are very far away. The unmodified Tychonic model works better, and is designed for, a smaller universe, while the neo-Tychonic model has no problem sustaining the gigaparsec sizes we commonly hear associated with modern astronomy.

More importantly, since those who favor an unmodified Tychonic model do so out of an allegiance to the assumption that Earth must be the center of the stellar revolutions, it is this very assumption that brings the validity of the model into question. Scripture does not say that the Earth is the center for the stars; it says only that the Earth is immobile. Granted, one can certainly advance an argument that the Earth should assume the center position based on nothing more than the definition of immobility within a sphere. Geometrically speaking, the only point that would not move, relative to the rest of the rotating sphere, is the exact center. Yet this fact merely begs the question: what constitutes the sphere of which Earth is the immobile center? Do the stars themselves define the universal sphere, or is the universal sphere defined by itself? By force of logic, we are compelled to say that the stars are merely *contained within* the universal sphere, but are not necessarily the composite body by which the sphere is defined. This is especially true when we understand that, besides the stars and other celestial bodies comprising the universe, the universal sphere has its own substance (ether), and thus it has a mass and velocity independent of the stars. It is the universe's own mass that is rotating around the immobile Earth, and as it does so, it carries the stars with it. As such, there is nothing to prohibit the stars from being slightly shifted to one side of the universal sphere and thus have their center on the sun, whereas the universal sphere itself is centered on the Earth. In fact, if that is the case, we would obtain the characteristic precession or "wobble" that we see in so many sectors of the cosmos. All this can be accomplished by keeping the Earth as the immobile center of the universe.

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[198] Walter van der Kamp advocated the unmodified Tychonic model.

Are the Stars Close or Far Away?

Finally, in remarking about the equivalence between the geocentric and heliocentric models for parallax, we must reiterate that the parallax in either system is based on the assumption that a vast distance separates the two stars being viewed in the telescope. But this is only an *assumption*, not a proven fact. Although we presently work from the assumption given to us by modern astronomy that the stars are very large and very far away, there is no indisputable proof for that conclusion. The stars could be very close and very small. Even with the finest optical instruments, the stars and galaxies remain as mere points of light through our telescope lenses. No one has ever obtained a finer focal point. In fact, modern astronomy has found that the stars have a much smaller angular size than previously estimated. Logically, then, it is impossible to be absolutely certain whether the star is large and distant as opposed to small and near based only on its size and luminosity. As a recent article in *Sky and Telescope* admitted:

> A bedrock problem in astronomy is simply figuring out how far away things are. Practically everything else about an object – its true size, its energy output – all the stuff you have to know to understand it – depends on simply knowing how far away it is. And even now, the poor quality of many astronomical distances remains a nagging problem.[199]

Recently the research team of astronomer Roberto Ragazzoni of the Astrophysical Observatory in Arcetri, Italy studied two images from the Hubble space telescope: one of a galaxy calculated to be 5 billion light years from Earth and another of an exploding star 42 million light years away. Although similar pictures have been produced by the Hubble space telescope for quite a while, Ragazzoni is apparently the first one to notice that no matter how far away the objects are purported to be, the Hubble pictures are always crisp and clear, never out of focus. With regard to the Big Bang theory, this creates a problem. Ragazzoni explains:

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[199] Alan MacRobert, "'The Antennae' Fall Into Line," *Sky and Telescope*, May 9, 2008.

> You don't see a universe that is blurred. If you take any Hubble Space Telescope Deep Field image you see sharp images, which is enough to tell us that the light has not been distorted or perturbed by fluctuations in space-time from the source to the observer.[200]

Ragazzoni, *et al.*, ascribe the lack of distortion to apparent discrepancies in Quantum mechanics that theorizes a Planck-scale ether between the star and the observer. They write:

> It has been noted (Lieu & Hillmann) that the cumulative effect of Planck-scale phenomenology, or the structure of spacetime at extremely small scales, can lead to the loss of the phase radiation emitted at large distances from the observer. We elaborate on such an approach and demonstrate that such an effect would lead to an apparent blurring of distant point sources. Evidence of the diffraction pattern from the Hubble Space Telescope observations of SN 1994D and the unresolved appearance of a Hubble Deep Field galaxy at $z = 5.34$ lead us to put stringent limits on the effects of Planck-scale phenomenology.[201]

Yet one might just as well ascribe the lack of distortion to the fact that the exploding star and the galaxy are not separated by 4.958 billion light years of space but are relatively close to one another; that neither the star nor the galaxy are very far away from Earth; and/or that the redshift of 5.34 assigned to the galaxy is not measuring its distance but its own peculiar radiation.

Various modern astronomers freely admit that the starry cosmos might be very close to us and not as vast as present cosmology dictates. In fact, one theory holds that much of what we see in the heavens beyond a certain point is a mere reflection. For example, the well-known astrophysicist of Princeton University, David Spergel, has recently found such evidence. Working alongside mathematician Jeffrey Weeks, *New Scientist* reports:

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[200] Robert Roy Britt, Space.com, April 2, 2003 interviewing Roberto Ragazzoni concerning the article "The Lack of Observational Evidence for the Quantum Structure of Spacetime at Planck Scales," *The Astrophysical Journal*, April 10, 2003, co-authored by Massimo Turatto and Wolfgang Gaessler.

[201] "The Lack of Observational Evidence for the Quantum Structure of Spacetime at Planck Scales," *The Astrophysical Journal*, April 10, 2003, p. L1.

> …scientists have announced tantalizing hints that the universe is actually relatively small, with a hall-of-mirrors illusion tricking us into thinking that space stretches on forever….Weeks and his colleagues, a team of astrophysicists in France, say the WMAP results suggest that the universe is not only small, but that space wraps back on itself in a bizarre way (*Nature*, vol. 425, p. 593)…. Effectively, the universe would be like a hall of mirrors, with the wraparound effect producing multiple images of everything inside.” [Spergel adds]: “If we could prove that the universe was finite and small, that would be Earth-shattering. It would really change our view of the universe.”[202]

In any case, applying parallax to the measure of stellar distances has its limitations. Its advocates admit that it cannot do so accurately beyond 300 light-years. Empirically speaking, then, no one is required to commit himself to a universe greater in size than 600 light-years in diameter. Any claims to something larger are simply not conclusive, since it has become obvious that, with all the anomalies associated with measuring distance by a star’s redshift, we have no indisputable yardstick to measure the universe.[203]

One other possible indication for a smaller universe is that stellar ellipses are all about the same size, although some have more eccentricity than others. As the reasoning goes: ellipses of the same size suggest that the stars are not very far apart. Moreover, if parallax is understood as stellar aberration, this would allow the stellar ellipses to be contained within a small universe of no more than 50 light-days in diameter. In this situation the stars would be encased in a stellatum, a circular band of definite but narrow thickness around the Earth. As Van der Kamp notes:

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[202] Hazel Muir, “Does the Universe Go On Forever,” *New Scientist*, October 11, 2003, p. 6.

[203] Martin Selbrede poses an interesting possibility for using redshift as a distance indicator, but one totally diverse from the modern Big Bang theory. After citing numerous sources showing that centrifugal force is caused by the rotation of the cosmic mass, Selbrede adds that the upward pull caused from the rotation will affect the travel of light from the stars to the earth. Citing Richard Feynman’s *Lectures in Physics*, vol. 2, pp. 42-10 and 42-11, and Misner, Thorne and Wheeler’s discussion 38.5 “Tests of Geodesic Motion: Gravitational Redshift Experiments” in their book *Gravitation*, pp. 1055-1060, Selbrede theorizes that redshift is not a Doppler phenomenon initiated by a receding star, but a gravitational/centrifugal phenomenon of a rotating star field. If so, he concludes: “This in turn would provide a new basis for measuring the distance of celestial objects, one wholly different than the system erected upon the Doppler view of the red shift, which could involve a significant remapping of the heavens” (*The Chalcedon Report*, 1994, p. 12). Of course, the distances measured would be much less than the distance claimed by Big Bang cosmology.

> Looking at the star Alpha Centauri from an Earth circling the sun, parallax measurements and trigonometry would assure us that the two are 1.3 parsecs, or more than 4.2 light years apart. But looking from an Earth circled by the sun, the distance turns out to be less than one twenty-fifth of that amount.[204]

The first one to propose such an arrangement was Thomas Wright (1750), who held the "grindstone" model wherein the stars were located between two concentric shells around the Earth. Accordingly, one could argue that the various biblical passages referring to the known and unchanging constellations (*e.g.*, God's challenge to Job: "Can you bind the chains of the Pleiades, or loose the cords of Orion? Can you lead forth the Mazzaroth [Zodiac] in their season, or can you guide the Bear with its children?")[205] imply that constellations can be formed because of the close proximity of its stars. It is also possible, however, to explain the appearance of these constellations simply because a few stars near the Earth can form the configuration, while other stars are too far away from Earth to form any visible constellations for the observer.

Although a small universe encased by a stellatum is certainly possible, ultimately it makes little difference to the geocentric model whether the universe is large, small, or somewhere in between. **Gerardus Bouw** has argued for a large universe (although by his own admission he is not absolutely committed to it, provided the physics of a small universe can be adequately explained). Bouw has four basic arguments for a large universe: (1) aberration is not parallax;[206] (2) the diameters of expanding nebulae;[207] (3) measurements of star diameters; (4) the nature of physics. Of these, the fourth is the most comprehensive and thus requires the adoption of Bouw's overall understanding of how the universe is put together. According to that understanding, Bouw argues that the "fundamental constants" of physics (*e.g.*, gravity, electric charges, position, time, temperature, entropy) can only be joined together in a limited number of ways in order that no one constant conflicts with the others. Since there is a plurality of fundamental constants, a least common denominator is needed to join them all together. This is accomplished in two ways, both of which are at the extreme ends of the physical spectrum. On the one hand, it is accomplished by reducing the mixing crucible to scales much smaller than atomic particles so that all the necessary constants are represented in their irreducible form; and, on the other hand, to test how these constants react in sizes as big as the universe, which is the ultimate large-scale environment. The crucial constants that need to be joined together are: Planck's constant, Boltzmann's constant, the speed of light, and the gravitational constant. When these constants are combined in their proper proportions, they will provide fundamental units in time, length, charge, mass and temperature, and they will, in turn, give us the corresponding size for the universe. As Bouw understands it:

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[204] Walter van der Kamp, *De Labore Solis*, p. 145.

[205] Job 38:31-32, RSV. Some appeal to Apocalypse 6:13's "And the stars of heaven fell unto the Earth," but this is not to be understood literally, for John is seeing a symbolic vision in heaven. See my book: *The Catholic Apologetics Study Bible*, Vol. 2, *The Apocalypse of St. John*, Queenship Publishing, 2006.

[206] Bouw's colleague, Walter van der Kamp, argued for a small universe and posited that stellar aberration and parallax were the same phenomenon. To that issue, Bouw writes: "It is significant that the moon, streetlights, and artificial

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satellites do not exhibit aberration. Any source of light originating inside the earth's gravitational field does not exhibit aberration. This may mean that aberration originates at the edges of gravitational fields, for the sun and planets do exhibit aberration" (*American Ephemeris and Nautical Almanac*, 1968, pp. x, 485). "That the sun and planets exhibit aberration presents us with the proof against Walter van der Kamp's thesis that aberration is actually parallax. If Walter's interpretation is correct, the planets and the sun should not participate in the 20".496 aberration because they are too close to the earth. Since they do, Walter's model requires the planets and the sun all to be 58 light-days from the earth, the same distance as the stars….There is another…problem….Unless the stars were [sic] all exactly the same distance from earth, there will be slight differences in their parallax. Indeed, such differences are detected" (*Biblical Astronomer*, Vol. 4, No. 67, p. 11).

[207] Bouw uses Betelgeuse as an example as it is blowing off gas at a rate of 10 km/sec. "The shell of material around it is 50'' (seconds of arc) across. If we assume a 50-light-day universe, then 1 km at the edge of the universe would subtend an angle of about 2×10^{-7} arc sec. This means that in one year Betelgeuse's shell would grow by 49'' of arc which, in about 40 years, would grow to the apparent size of the full moon. It would seem from the 50-light-day universe model that Betelgeuse's shell is only about a year old; but the stuff has been seen streaming out of the star for tens of years" (*The Geocentric Papers*, p. 38).

> The size of the atom is about 10^{-13} cm. The size of the nucleus is about a thousandth of that. As we proceed to smaller and smaller scales nothing interesting seems to be happening until we get to a scale of about 10^{-33} cm. At that size, called a *Planck length*, fascinating things happen…. we find that the warp and woof of heaven comes into focus. Physics attempts to derive relationships between the different properties of objects. Such relationships typically involve certain constants: values which are generally assumed not to change over time. The speed of light is such a constant. So is the gravitational constant. It turns out that there are relationships among these constants themselves, and those relationships all express themselves to specifics at the Planck length.[208]

> The fundamental units of length and time combine to give the speed of light which is tied to the expansion rate of the universe. Thus from the constants we can derive some large numbers which can be interpreted as the size of the universe, a speed limit for matter (which most scientists today use to infer an age but the quantity is actually determined by the expansion rate of the universe, not its age), and an apparent mass. These quantities, which actually define the laws of physics, are tied to a large universe and not a small universe.[209]

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[208] Gerardus D. Bouw, *Geocentricity*, pp. 324-325.

[209] Gerardus Bouw, *The Geocentric Papers*, p. 39. Bouw qualifies his remarks by one other possibility for a small universe: "…a model which holds that the parallaxes of stars are not due to a Tychonian-like oscillation of stars and sun about the Earth but are due to the eccentricity of the path which the sun and stars take about the Earth. Since the eccentricity of the Earth-sun path is 0.017, this would make all parallax-based distances about 60 times closer. This would make the nearest star system, Alpha Centauri, to be about 24 light-days distant or about 360,000,000,000 miles. The star would be about 14,500 miles in diameter. Sirius…would be 1.8 light-months distant which would place it 54 light-days out….The main problem with this variant of a small universe is that the physics for such small, hot plasmas (stars) would have to be developed….A non-gravitationally bound plasma would quickly disrupt" (*ibid*).

The earth is vast, and heaven is high,
and the sun is swift in its course,
for it makes the circuit of the heavens
and returns to its place in one day.

Is he not great who does these things?
But truth is great, and stronger than all things.

1 Esdras 4:34-35

"We're just children looking for answers....As the island of our knowledge grows, so does the shore of our ignorance."

John Wheeler[210]

"Never run after a bus or a woman or a cosmological theory, because there'll always be another one in a few minutes."

Wheeler's Yale acquaintance

"Your sages were wrong to submit to the non-Jewish scholars. They assented to a lie, for the truth lay with the Jewish sages."

Tycho Brahe[211]

"If it be granted that the Earth moves, it would seem more natural to suppose that there is no system at all, but only scattered globes, than to construct a system of which the sun is the center"

Francis Bacon[212]

"One may understand the cosmos, but never the ego; the self is more distant than any star." G. K. Chesterton[213]

"...we are at the center of a series of explosions. This is an anti-Copernican embarrassment."

Halton Arp[214]

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[210] Interview with John Horgan, as cited in *The End of Science*, p. 83.

[211] Tycho Brahe to Jewish astronomer David Gans. André Neher, *Jewish Thought and the Scientific Revolution of the Sixteenth Century: David Gans* (*1541-1613*) *and His Times*, translated from the French by David Maisel, 1986, p. 218.

[212] Attributed, not verified.

[213] G. K. Chesterton, *Orthodoxy*, New York, Doubleday, 1957, p. 54.

[214] *Seeing Red: Redshifts, Cosmology and Academic Science*, p. 195.

Chapter 9

Modern Science and the Acceptance of Geocentrism by Principle

In previous chapters we discovered that a geocentric system is geometrically and kinematically the same as a heliocentric system. As Hoyle reminds us: "The equivalence of these two pictures was already known to Apollonius, who lived in the third century, B.C., long before Ptolemy (ca. A.D. 150)."[215] As Thomas Kuhn noted of the orrery:

> Now imagine that…the whole mechanism is picked up…and put down again with the sun fixed at the central position formerly held by the Earth…All of the geometric spatial relations of the Earth, sun and Mars…are preserved…and since only the fixed point of the mechanism has been changed, all the relative motions must be identical…the Tychonic system is transformed to the Copernican system simply by holding the sun fixed instead of the Earth. The relative motion of the planets are the same in both systems, and the harmonies are therefore preserved.[216]

The next phase of our investigation must address the matter of how the geocentric system relates to the rest of the universe. It is one thing to use an orrery to demonstrate the equivalence between the heliocentric and geocentric systems in regard to the *annual* motions of the sun and planets, but we also need to explain the daily motions. In the heliocentric system, of course, the daily motion is accounted for by supposing that the Earth rotates on its axis every 24 hours. As such, the sun, moon, and stars will appear to circle the Earth each day. Conversely, the geocentric system holds that the motion of these celestial bodies is a *real* motion and is not an apparent one caused by a rotation of the Earth. In fact, this system would more appropriately be called a "geostatic" system. Whereas "geocentric" literally means that the Earth is the center of the universe,

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[215] Fred Hoyle, *Nicolaus Copernicus*, 1973, p. 63.

[216] Thomas S. Kuhn, *The Copernican Revolution*, 1959, pp. 204-205.

"geostatic" means that the universe is rotating around the Earth, in addition to the fact that the Earth is in the center of the universe.

Explaining a geostatic universe is a little more involved than explaining a geocentric universe. For this very reason, some geocentrists have opted for the model in which the Earth, even though it is the center of the universe, nevertheless, rotates on its axis every 24 hours.[217] For the dedicated scripturalist, and especially one of the Catholic faith, a rotating Earth in a geocentric universe is not a viable option. First, the condemnation of Copernicanism issued in the papal and Sacred Congregation pronouncements of the seventeenth century included the censoring of the "diurnal movement of the Earth," that is, it condemned both an Earth that revolved around the sun *and* an Earth that rotated on an axis. We will address these pronouncements in more detail in Volume II of this series. For now we merely note that most geocentrists are also geostatists, simply because, using Scripture as the sole arbiter between the heliocentric and geocentric models, they understand that the Earth does not move at all, either laterally, tangentially, angularly or in any other way. It is the center of the universe and is the only celestial body that does not move. Galaxies, stars, the sun, moon, planets, the cosmic microwave background radiation, and every other celestial object or force are in daily motion around an immobile Earth. In this way, the Earth is the absolute frame of reference for every movement in the sky, rendering the theory of Relativity erroneous and superfluous.

Absolute Rest versus Relative Motion

In reference to Relativity theory, we noted in Chapter 4 that Einstein's struggle to understand Maxwell's equations concerning electricity and magnetism demonstrated the difference between absolute rest and relative motion. Let us recall Einstein's description of this phenomenon:

> For if the magnet is in motion and the conductor at rest, there arises in the neighborhood of the magnet an electric field with a certain definite energy, producing a current at the places where parts of the conductor are situated. But if the magnet is stationary and the conductor in motion, no electric field arises in the neighborhood of the magnet. In the conductor, however, we find an electromotive force, to which in itself there is no

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[217] One example of a geocentric/rotating Earth model is that of Fernand Crombette, which will be critiqued in volume II of this series.

> corresponding energy, but which gives rise – assuming the equality of the relative motion in the two cases discussed – to electric currents of the same path and intensity as those produced by the electric form in the former case.[218]

As we noted previously, the conventional explanation of this phenomenon is: if the conductor is moving toward a stationary magnet, then the electrical charge in the conductor is pulled around the conductor by the force of the magnetic field. Conversely, if the magnet is moving toward the conductor, the increasing magnetic field produces an electric field that drives the charge around the conductor. In order for this to occur, the relationship between the conductor and the magnet cannot be "relative"; rather, we have a case of absolute rest and absolute motion. In Maxwell's explanation it made a difference whether the magnet or the conductor was at rest, for each case produced a different location for the same electrical current and thus he produced two separate equations for the results. Einstein did not accept Maxwell's explanation. The reason is noted in the parenthetical statement he adds toward the end of the above paragraph: "…assuming the equality of the relative motion in the two cases discussed…" If the "relative motion" is the same in both cases (that is, a conductor moving toward a stationary magnet is the same as a magnet moving toward a stationary conductor), Einstein assumed that the results should be identical, that is, in both cases the current produced should either be always around the magnet or always around the conductor, and not switch between the magnet and the conductor. Since the results were not identical, Einstein sought to find a reason, but he would do so assuming the principle of Relativity and its application of "fields."

Having a relativistic explanation to the above phenomenon was very important to Einstein, since it would also provide him with an explanation why the light beams of Michelson-Morley's interferometer were not affected by the "movement of the Earth." As Einstein "relativized" Maxwell's magnet and conductor, so he did with Michelson-Morley's interferometer. Both experiments were vitally important to him. A solution for one would necessarily be the same for the other. Both had to be relativized or neither could be relativized.

If, for all the reasons we have stated thus far, such "relativizing" of results is prohibited, our only recourse is a system built on absolute rest and absolute motion. In the case of the magnet and the conductor, respectively, we must say that one is at absolute rest while the other is in absolute motion, each "absolute" marked by the production of an electric current in a different location.[219] In the case of the Michelson-Morley experiment, we are left with the absolute rest of the Earth and the absolute motion of the light beams.

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[218] Zur Electrodynamik Bewegter Körper ("On the Electrodynamics of Moving Bodies"), *Annalen der Physik*, Vol. 17, 1905, p. 1.

In addition, the above phenomenon regarding absolute rest and absolute motion presents a situation in which Einstein's relativizing of the Earth's rotation in a fixed universe as co-equivalent to a rotating universe around a fixed Earth, although conceptually equivalent, demands, as does Maxwell's concept of the conductor and magnet, that we dispense with the dualism and insist that ultimately only one can be right. As Maxwell was able to distinguish between whether the magnet or the conductor was moving depending on where the electric current appeared, so it should be possible to perform experiments, or reinterpret already performed experiments, to determine which of the cosmological models is correct.[220] We, of course, predict that such experiments, if properly designed, will show that the Earth is in absolute rest and the universe in absolute motion. Laying aside the mathematical "transformation" contortions of Lorentz and Einstein, we already have confirmation that the interferometer and similar experiments demonstrate this to be the case.

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[219] That is, an object resting on the Earth is in a state of absolute rest, since the Earth is already at absolute rest compared to the rest of the universe. Accordingly, any object in motion on the Earth is in absolute motion, since the Earth is the absolute reference frame against which the object moves.

[220] An experiment demonstrating the difference between the heliocentric and geostatic systems would be based on Maxwell's laws. For example, a charged object at rest on a geostatic Earth should produce no magnetic field if it is placed at the poles or the equator. The same object on a diurnally moving Earth, however, should produce no magnetic field when placed at the poles, but should produce a magnetic field at the equator corresponding to its electric charge multiplied by the rotation velocity of the Earth, which is assumed to be 1054 mph. The magnetic field of the Earth can either be subtracted from the resulting measurements, or the experiment can be performed in a diamagnetic container (since it excludes external fields). At any latitude the magnetic field will be present, albeit it will be smaller the further away from the equator the experiment is performed. As such, experiments can be performed at two latitudes of considerable distance from each other. If there is no difference between the two respective magnetic fields, then the result is null and the geostatic system has been vindicated. The only experimental difficulty would be to find a way to make the magnetometer be at rest with respect to the center of the Earth.

Fred Hoyle's Geocentrism

The issue regarding whether the Earth is rotating in a fixed universe or the universe is rotating around a fixed Earth has not escaped a few prominent physicists and astronomers. We have already mentioned George Berkeley and Ernst Mach as examples of those who recognized the equivalence between the two systems. Einstein, Eddington, Born and many others found that little argument could be mounted against the equivalence. Yet another prominent voice is astronomer Fred Hoyle. Whereas other physicists and astronomers are very careful not to educate the public to the equivalence between the geocentric and heliocentric systems, Hoyle has been quite candid in providing the necessary information, often to the consternation of his colleagues. In this respect, Hoyle's book, *Nicolaus Copernicus: An Essay on His Life and Work*, although a commemorative effort celebrating the 500th anniversary of the birth of Copernicus, is actually a landmark work revealing in detail the false impression left by the Copernican revolution. As one reviewer noted, Hoyle's book is

> …the only brief account, using understandable modern terminology, of what Ptolemy and Copernicus really did. Epicycles are just data analysis (Fourier series), they don't imply any underlying theory of mechanics. Copernicus did not prove that the Earth moves, he made the equivalent of a coordinate transformation and showed that an Earth-centered system and a sun-centered system describe the data with about the same number of epicycles.[221]

Although in the final analysis Hoyle is a true-blue Copernican (as is the above reviewer), he is not the least bit embarrassed in pointing out the flaws and inadequacies of either the Copernican system or the cosmetic refinements offered by the Keplerian system. In fact, in order to explain the workings of any system, Hoyle frequently resorts to employing geocentric diagrams, since they are, by his own admission, easier to use. In any case, it is the last chapter of Hoyle's book that will be the focus of our analysis, for here, after having shown that there is no kinematical difference between a sun-centered and an Earth-centered system, Hoyle reveals the crux of the debate between heliocentrism and geocentrism. He begins:

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[221] Physicist J. L. McCauley, Letter on file, 2005.

> At the beginning of Chapter I it was stated that we can take either the Earth or the Sun, or any other point for that matter, as the center of the solar system. This is certainly so for the purely kinematical problem of describing the planetary motions. It is also possible to take any point as the center even in dynamics, although a recognition of this freedom of choice had to await the present century. Scientists of the nineteenth century felt the heliocentric theory to be established when they determined the first stellar parallaxes. The positions of the nearby stars were found to undergo annual oscillations, which were taken as reflections of the Earth's annual motion around the Sun. But, kinematically speaking, we can always give to the stars epicyclic motions similar to the ones we found for the planets in Chapter IV. Indeed, if we wish to consider the Earth to be at rest, it will be necessary to give an annual epicyclic motion to every object in the distant universe, as well as to the planets of the solar system. We cannot dismiss such a procedure simply on grounds of inconvenience or absurdity. If our feeling that the Earth really goes around the Sun, not the Sun around the Earth, has any objective validity, there must be some important physical property, expressible in precise mathematical terms, which emerges in the heliocentric picture but not in a geocentric one. What can this property be?[222]

Thus far, even though he is a heliocentrist by preference who is looking for some proof of his system, Hoyle has been fair with his geocentric counterpart. What other avowed heliocentrists ridicule as "absurd," Hoyle counts as a viable alternative. In fact, we should add here that many pages earlier Hoyle had already suggested to his reader that one of the reasons the stars may follow an epicyclic pattern is due to what

> …was already known to the Greeks that spring-to-summer-to-autumn differs from autumn-to-winter-to-spring by three days. It was explained by Hipparchus."[223]

Since, as Hoyle admits, in the geocentric system the universe rotates around the Earth and carries the sun with it, it follows that both the sun and the stars will form an annual epicyclic path with respect to the Earth. As we suggested earlier, the epicycles may exist because there is a designed imbalance in the distribution of matter in the universe that will subsequently cause a precession or wobble in the rotation, which in turn will help produce the periodic movement that we experience practically on Earth as the four seasons. In this view, the universe is much like a spinning gyroscope that wobbles when it begins to tilt, or when it is disturbed while rotating; or has an additional weight at one point on its circumference.

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[222] *Nicolaus Copernicus*, pp. 82-83.
[223] *Nicolaus Copernicus*, p. 52.

In his next section, Hoyle delves deeply into Newton's laws of motion:

> Consider the well-known Newtonian equation: mass × acceleration = force. The mass for any particular body is intended to be always the same, independent of where the body is situated or of how it is moving. Suppose we describe the position of a body as a function of time in some given reference frame, and suppose we know the mass. Then, provided we also have explicit knowledge of the force acting on the body, Newton's equation gives us its acceleration. Determining the motion from there on is simply a mathematical problem – in technical terms we have to integrate the above equation. This procedure, which forms the basis of Newtonian mechanics, fails unless we know the force explicitly. In the Newtonian theory of the planetary motions, the theory leading to the basic ellipse from which we worked in Chapter IV, the force is taken to be given by the well-known inverse law: Two masses, m_1 and m_2, distance r apart, attract each other with a force Gm_1m_2/r^2 where G is a numerical constant. The force is directed along the line joining the bodies.[224]

Here Hoyle is simply giving his reader a lesson in basic physics, while at the same time introducing him to certain inadequacies of Newton's laws that we noted earlier when citing the work of Dennis Sciama. Now Hoyle applies this critique to the crux of the issue:

> Now comes the critical question: In what frame of reference is this law considered to operate? In the solar system we cannot consider the inverse-square law to operate *both* in the situation in which the Sun is taken as the center and in that in which the Earth is taken as the center, because Newton's equation would then lead to contradictory results. We should find a planet following a different orbit according to which center we chose,

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[224] *Nicolaus Copernicus*, pp. 83-84.

> and a body cannot follow two paths (at any rate not in classical physics). It follows that in order to use the inverse-square law in a constructive way we must make a definite choice of center. The situation which now emerges is that to obtain results that agree with observation we must choose the Sun as the center. If the Earth were chosen instead, some law of force other than the inverse-square law would be needed to give motion that agreed with observation.[225]

Hoyle is reiterating one of the most commonly used arguments to support the heliocentric theory. Based on Newton's inverse-square law, it is ordinarily assumed that a massive body like the sun could not possibly revolve around the tiny Earth. Thus, for the moment, Hoyle seems to be giving credence to the heliocentric theory over the geocentric. In reality, he is only setting up the means by which one will be able to discern the flaws in this traditional thinking. He continues:

> Although in the nineteenth century this argument was believed to be a satisfactory justification of the heliocentric theory, one found causes for disquiet if one looked into it a little more carefully. When we seek to improve on the accuracy of calculation by including mutual gravitational interactions between planets, we find – again in order to calculate correctly – that the center of the solar system must be placed at an abstract point known as the "center of mass," which is displaced quite appreciably from the center of the Sun. And if we imagine a star to pass moderately close to the solar system, in order to calculate the perturbing effect correctly, again using the inverse-square rule, it would be essential to use a "center of mass" which included the star. The "center" in this case would lie even farther away from the center of the Sun. It appears, then, that the "center" to be used for any set of bodies depends on the way in which the local system is considered to be isolated from the universe as a whole. If a new body is added to the set from outside, or if a body is taken away, the "center" changes.[226]

By this analysis Hoyle has admitted one very important discovery of modern cosmology, that is, the stars affect what occurs in our sun-Earth system. This is not difficult even for a heliocentrist to understand, since in his system the sun is revolving around the Milky Way at a speed of about 500,000 miles per hour (which is about eight times faster than he believes the Earth is revolving around the sun). If the sun must travel so fast in order to equal the Milky Way's pull toward the center, then it can be safely said that the mass of stars at the core of the galaxy have a great effect on the sun, and in turn, a great effect on the planets going around the sun. Hoyle, for simplicity's sake, confined his example to "a star…moderately close to the solar system," but in reality, there are trillions upon trillions of stars in the universe; and each one, however small, has an effect on our sun-Earth system. As such, the stars must be strategically placed in the universe in order to allow the proper balance of forces to be maintained in the sun-Earth system. No doubt this is implied in such Scriptural passages as Psalm 147:4: "He determines the number of the stars, he gives to all of them their names," or Isaiah 40:26: "Lift up your eyes on high and see who has created these stars. He who brings out their host by number, He calls them all by name; by the greatness of His might, and by the strength of his power, not one is missing."

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[225] *Nicolaus Copernicus*, pp. 84-85.

[226] *Nicolaus Copernicus*, p. 85.

We can draw two more points from the foregoing information. First, since the stars produce forces affecting our sun-Earth system, then it would be logical to conclude that the forces we experience in our locale are, in part, a product of the conglomeration of stellar forces acting upon us. This means that such things as the inverse-square law, centrifugal force, Coriolis force, and any other force or momentum we calculate on Earth must in part be a result of the forces surrounding us from the universe. As Misner, Thorne and Wheeler have stated it: "Mass there governs inertia here."[227] For example, although the inverse-square law is normally understood as being the ratio of the mass to the distance of two or more local objects (*e.g.*, sun and Earth), in reality, the formula Gm_1m_2/r^2 implicitly includes the mass, force, and distance of all the universe's stars, as well as the objects in the immediate locale under consideration. A simple way to understand this is: if the universe did not have stars, then Gm_1m_2/r^2 would be inaccurate and need to be revised. As Hoyle has noted, even one close star can affect the "center of mass" in our sun-Earth system. Accordingly, one must understand the effect of the trillions of stars in the universe and apply it to the phenomena of gravity and inertia.

Consequently, modern science is unable to refute the proposition that Gm_1m_2/r^2 is a product of both the local and the non-local systems due to the fact that it has not been able to explain the cause of gravity. Although the components of Gm_1m_2/r^2 appear as if the force of gravity is merely a ratio of mass to distance of the local bodies, since modern science has no explanation for what actually causes gravity and can only tell us that the force increases or decreases depending on mass and distance, it cannot discount the rest of the universe as being integrally involved in the increase or decrease of gravitational force. For example, two local bodies may merely be disturbances in a sea of gravitational force emanating from the remote regions of the universe that we, in turn, conveniently measure by the formula Gm_1m_2/r^2, and which modern science, without knowing any differently, attributes only to the interaction between the two bodies in our local system.

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[227] *Gravitation*, pp. 543, 546-47, 549. That is, the mass of the stars governs inertia on Earth.

Another facet of the principle that Hoyle brings out regarding the "center of mass" (also known as a "barycenter") and how it is affected by the stars is that, since, as we stipulated, the stars are precisely numbered and strategically placed in the universe (which coincides with the fact that, according to Genesis 1:1-2, the Earth was the first strategically placed object in the universe), then it follows that this precise alignment of the stars would be in a counterbalancing formation against our sun and planets, situated in such a way as to make Earth the immovable barycenter of the universe. Accordingly, such passages as Job 26:9 [LXX 26:7]: "He…hangs the Earth upon nothing," which indicates that the Earth is suspended in space and not supported in any sense by any other celestial body, would be precisely the case if the Earth were the "center of mass" for the universe. If a hole could be dug to the center of the Earth, the above circumstance would be analogous to placing a baseball at the center where it would be suspended weightless and motionless. Yet gyroscopic laws show that any force that attempts to move the barycenter will be resisted by the entire system, and analogously the Earth will resist any force against it with the help of the entire universe. Just as a small gyroscope will keep a huge oil tanker afloat across the ocean without swaying, so the universe in rotation does the same with the center of mass, the Earth.[228] Anaximander (d. 547 B.C.) held to the same idea: "The Earth…is held up by nothing, but remains stationary owing to the fact that it is equally distant from all other things."[229] Perhaps he obtained his view from the Hebrew writers that antedated him by at least a millennium.

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[228] Charles W. Misner, Kip S. Thorne and John A. Wheeler, *Gravitation*, 1973, pp. 1117-1119.

[229] As obtained from Aristotle's *De Caelo*, 295b32, cited in Popper's *Conjectures and Refutations*, p. 138. Anaximander, however, understood the Earth to be in the shape of a drum rather than a globe.

The Gyroscopic Effect on the Earth

Misner, Thorne and Wheeler confirm these mechanical principles from a Relativistic perspective. Acknowledging the gyroscope principle between the Earth and the stars, they write:

> Assume that any nongravitational forces acting on the gyroscope are applied at its center of mass, so that there is no torque in its proper reference frame. Then the gyroscope will 'Fermi-Walker transport' its spin along its world line...The spin is a purely spatial vector in this co-moving frame; its length remains fixed (conservation of angular momentum); and its direction is regulated by the Fermi-Walker transport law. The basis vectors of the co-moving frame are not Fermi-Walker transported, by contrast with the spin. Rather, they are tied by a pure boost (no rotation!) To the PPN [Parametrized Post-Newtonian, p. 1069] coordinate grid, which in turn is tied to an inertial frame far from the solar system, which in turn one expects to be fixed relative to the 'distant stars.' Thus, by calculating the precession of the spin relative to the co-moving frame, one is in effect evaluating the spin's angular velocity of precession, relative to a frame fixed on the sky by the distant stars.[230]

It would certainly require an infinite mind to see everything at once and calculate all the interacting forces so that every object could be placed in its proper position in the universe. Modern science certainly can raise no objection to the possibility of such a universe, for its very laws give it sanction. In fact, as photographs of the universe show, there may be a good reason why the distribution of stars in some places of the universe is not isotropic, that is, why various sections of the universe contain no stars, and other parts contain huge clumps of stars. These variations are not accidental but are the precise distribution patterns required in order to maintain the forces that keep Earth as the barycenter in the midst of a sun and planets that are whirling about its equatorial plane.

Hoyle proceeds in his argumentation:

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[230] Charles W. Misner, Kip S. Thorne and John A. Wheeler, *Gravitation*, 1973, p. 1117. Misner, et al, already stated much earlier in their book that the CMB had the precise form and intensity expected if Earth were the centerpiece of a blackbody cavity (*Gravitation*, pp. 764-797). The logical conclusion should have been that the Earth *is in the center* of the universe and the universe is closed.

> A similar circumstance was already present throughout our calculations, when we regarded angles as being measured with respect to a "fixed direction," it being implied that distant stars had directions that were "fixed" in this sense. If we make a calculation, using both Newton's equation and the inverse-square law, but measuring angles with respect to a direction that rotates with respect to the distant universe, things go very wrong. Newton was fully aware that his system of dynamics would work correctly only provided the "fixed directions" in the theory were chosen in a suitable way. His reference to the well-known rotating-bucket experiment was intended to illustrate this point.[231]

Here Hoyle merely touches upon a subject that we covered at great length in previous chapters – Newton's rotating-bucket of water. We discovered that the water in the bucket shows that there is an outside force causing the water to climb the inside walls of the bucket. Newton's explanation was that the water was curving upward in relation to absolute space, and that rotation was the unique movement that caused it, a phenomenon that today we call centrifugal force. But Newton, by his own admission, did not know the physical reason why a rotating object had such an outward force. It is good to remember that Newton did not have an explanation for the causes of all the forces for which he has become famous (gravity, inertia, centrifugal force). He merely had a knack for figuring out the mathematical relationship among these mysterious forces.

As we noted, Ernst Mach and Albert Einstein proposed their own gravitational theories in order to explain the water-bucket phenomenon. Mach insisted that the water curved upward because it was reacting to the gravity from the mass of distant stars surrounding it. Einstein had a similar answer, except that he attempted to make the gravitational force of the stars combine with the local force of space-time, but in essence, the stars remain a vital force in the bending of the surface of the water. In any case, Hoyle's reference to Newton's water-bucket shows that he knows there is more to this cosmological puzzle than meets the eye, and that the conventional means of supporting the heliocentric theory (*viz.*, by the inverse-square law) is simply not going to pass muster. Hoyle continues:

> It is clear therefore that in order to define the appropriate "center" of the local system in a useful way, and in order to define "fixed directions" relative to which angles are to be

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[231] *Nicolaus Copernicus*, pp. 85-86.

> measured, we must take account of the relation of the local system to the universe outside. It seems that the local laws of force take simple forms only when the center is unaccelerated with respect to a frame of reference determined by the universe in the large, and when the fixed directions do not rotate with respect to the distant universe. From this point of view we can compare the heliocentric and geocentric theories of the solar system in an unequivocal way. We ask: Is it the Sun that is accelerated with respect to the universe, or is it the Earth?[232]

Thus, having admitted that he cannot speak of a "center" unless he includes the universe at large, Hoyle nevertheless presses for the option of applying a local frame of reference, since that will be the only way to give preference to choosing the Earth as the accelerating body rather than the sun. As such, Hoyle answers his own question:

> Neglecting small effects, the answer is that the Earth is accelerated, not the Sun. Hence we must use the heliocentric theory if we wish to take advantage of simple rules for the local forces.[233]

In other words, in order to give legitimacy to the heliocentric system, Hoyle must resort, even against his clear admissions concerning the force of the entire universe, to limiting his analysis to the local system of the sun and Earth. By eliminating the stars, Hoyle can then claim that the inverse-square law is merely a local phenomenon, and thus demand that the smaller body (Earth) accelerate against the larger body (the sun), rather than vice-versa. Unfortunately, this is the problem with most of modern cosmology. Although they acknowledge the powerful force of the stars due to the fact that the sun (supposedly) revolves around its own galaxy, (and the galaxy revolves around other galactic clusters at a speed even faster than the sun), yet when support is required for the heliocentric system, modern cosmology conveniently removes the stars and galaxies from the grand scheme of things in order to be left with mere "local" forces in order to have the Earth accelerating with respect to the sun.

Being the honest astronomer and physicist he is, however, Hoyle still leaves room for his geocentric opponent, saying, "But this is not to say that we cannot use the geocentric theory if we are willing to use more complex rules for the forces."[234] By "complex…forces" Hoyle is referring to the force of the trillions of stars in the universe, forces which it would be very difficult for him to calculate but that he knows implicitly affect our local system. Amazingly, Hoyle admits that if the "complex forces" and "fixed directions" are followed step-by-step until their logical end, the barycenter of the universe will drift further away from the sun and closer to the Earth. Newton tried to stop this drift by propping up his "absolute space," but since that is merely a convenient invention, Hoyle recognizes that this only leaves the stars and the rest of the universe to define the barycenter. Thus, not only has Hoyle admitted to the viability of the geocentric system based on the equivalence of the geocentric and heliocentric "kinematics," he has now given full credence to the geocentric system by admitting that alternative measurements of forces can be used to show how the geocentric system functions.

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[232] *Nicolaus Copernicus*, p. 86.

[233] *Nicolaus Copernicus*, p. 86.

Hoyle is not done yet. He gives further reasons for questioning the wisdom of modern science in settling upon heliocentrism as its preferred model.

> The present discussion has been formulated from the standpoint of the Newtonian theory, which is not well suited to problems concerning the universe in the large. We might hope therefore that the Einstein theory, which is well suited to such problems, would throw more light on the matter. But instead of adding further support to the heliocentric picture of the planetary motions, the Einstein theory goes in the opposite direction, giving increased respectability to the geocentric picture. The relation of the two pictures is reduced to a mere coordinate transformation, and it is the main tenet of the Einstein theory that any two ways of looking at the world which are related to each other by a coordinate transformation are entirely equivalent from a physical point of view. Moreover, in the Einstein theory the method of calculating the effect of gravitation is changed to a form which applies equally to all such related ways of expressing a problem.[235]

As we noted in earlier chapters dealing with Einstein, it is quite ironic when we consider that Einstein's theory was formulated for the express purpose of relativizing nature so that no one could lay claim to a motionless Earth, yet this same theory forces science to come full circle and admit that a motionless Earth in the center of the universe is just as physically and mathematically viable as a moving Earth in a fixed universe. In the face of this, Hoyle tries one last ditch effort to save face for heliocentrism:

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[234] *Nicolaus Copernicus*, pp. 86-87.

[235] *Nicolaus Copernicus*, p. 87.

> It may still happen that it is easier to work through the details of a particular problem with respect to one coordinate system rather than to another, but no special physical merit is to be adduced from such a circumstance. Indeed, from a mathe-matical point of view, the problem of the planetary motions certainly continues to be easier to grapple with in the heliocentric picture. The simplication of such a picture shows itself in the Einstein theory through boundary conditions which are impressed on the space-time structure at a large distance from the Sun – which is to say in terms of the control imposed by the universe in the large.[236]

As we see, although Hoyle proposes that heliocentrism is easier to use on a mathematical basis, nevertheless, he reinforces the fact that nothing in the heliocentric system provides it a "special physical merit." In other words, there is no physical basis for preferring heliocentrism over geocentrism, let alone any proof for it; rather, there is merely the option of representing the heliocentric system by a less laborious mathematical analysis. Even that point is a matter of opinion, since the "mathematics" to which Hoyle is referring is "Einstein's theory through boundary conditions…imposed by the universe at large." This is Einstein's attempt, through the use of geodesics and tensor calculus, to meld the local reference frame with the universe's reference frame. Einstein used this same melding of local and universal forces in order to explain Newton's water-bucket phenomenon.

Hoyle makes his final admission in the last paragraph of the book:

> So we come back full circle to what was said at the beginning of this book. Today we cannot say that the Copernican theory is "right" and the Ptolemaic theory "wrong" in any meaningful physical sense. The two theories, when improved by adding terms involving the square and higher powers of the eccentricities of the planetary orbits, are physically equivalent to one another. What we can say, however, is that we would hardly have come to recognize that this is so if scientists over four centuries or more had not elected to follow the Copernican point

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[236] *Nicolaus Copernicus*, pp. 87-88.

> of view. The Ptolemaic system would have proved sterile because progress would have proven too difficult.[237]

In other words, the one thing that the venture into Copernicanism accomplished is to reinforce the viability of the Ptolemaic system. In effect, Hoyle has shown us that the battle between heliocentrism and geocentrism, at least with respect to daily motions, is over the adoption of a purely local system as opposed to a non-local or universal system. As we have seen throughout this volume, there is no escape from the latter. Although the fact is often camouflaged under different names, modern physics has not only accepted that motion can only properly be explained by reference to the non-local system, but Quantum Mechanics has divorced itself almost entirely from the local system prescribed by Relativity theory.[238]

Einstein's Geocentrism

Still, if one were to insist upon a Relativistic explanation of forces, it is, ironically, Relativity that lends the greatest support to a geocentric universe. For example, in a June 25, 1913, letter to Ernst Mach, Einstein writes the following:

> [Y]our happy investigations on the foundations of mechanics, Planck's unjustified criticism notwithstanding, will receive brilliant confirmation. For it necessarily turns out that inertia originates in a kind of interaction between bodies, quite in the sense of your considerations on Newton's pail experiment. The first consequence is on p. 6 of my paper. The following additional points emerge: (1) If one accelerates a heavy shell of matter S, then a mass enclosed by that shell experiences an accelerative force. (2) If one rotates the shell relative to the fixed stars about an axis going through its center, a Coriolis force

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[237] *Nicolaus Copernicus*, p. 88.

[238] As Misner, Thorne and Wheeler state: "The uncertainty principle thus deprives one of any way whatsoever to predict, or even to give meaning to, 'the deterministic classical history of space evolving in time.' *No prediction of spacetime, therefore no meaning for spacetime*, is the verdict of the quantum principle. That object which is central to all of classical general relativity, the four-dimensional spacetime geometry, simply does not exist, except in classical approximation" (*Gravitation*, pp. 1182-3, emphasis theirs).

> arises in the interior of the shell, that is, the plane of a Foucault pendulum is dragged around.[239]

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[239] A series of four letters compiled by Friedrich Herneck in “Zum Briefwechsel Albert Einsteins mit Ernst Mach,” *Forschungen und Fortschritte*, 37:239-43, 1963. The original letter was released from the estate of Albert Einstein by the executors Helen Dukas and Otto Nathan. Copy of the original letter is reproduced in Misner, Thorne and Wheeler’s *Gravitation*, pp. 544-545. Other sources verify Einstein’s mathematical analysis. In 1978, **Lawrence P. Orwig** of the University of Wisconsin discovered that: “The interior field of a thin mass shell or arbitrary momentum per unit mass *a* …in a parameter ($V^2 = 1\text{-}2m/R + a^2/R^2$) which measures the nearness of the shell to its gravitational radius….Shell shape is arbitrary beyond the requirement of sphericity in the limits of $a > 0$ or $V > 0$. It is shown that as $V > 0$, the interior inertial frames are dragged around rigidly at the same rate as the shell, for all *a*” (Lawrence P. Orwig, “Machian Effect in Compact, Rapidly Spinning Shells,” *Physical Review* D, 1757-1763, 1978, abstract). **Oyvind Grøn and Erik Eriksen** say much the same. Citing Orwig’s previous work, they write: “It was found that in the limit of a spherical shell with a radius equal to its Schwarzschild radius, the interior inertial frames are dragged around rigidly with the same angular velocity as that of the shell. In this case of ‘perfect dragging’ the motion of the inertial frames is completely determined by the shell” (“Translational Inertial Dragging,” *General Relativity and Gravitation*, Vol. 21, No. 2, 1989, pp. 109-110. My thanks to Martin Selbrede for these sources and analysis). To show how General Relativity posits no barriers to geocentrism, Grøn and Eriksen provide an incontestable example of its application: “As an illustration of the role of inertial dragging for the validity of the strong principle of relativity, we consider the Moon orbiting the Earth. As seen by an observer on the Moon both the Moon and the Earth are at rest. If the observer solves Einstein’s field equations for the vacuum space-time outside the Earth, he might come up with the Schwarzschild solution and conclude that the Moon should fall toward the Earth, which it does not. So it seems impossible to consider the Moon as at rest, which would imply that the strong principle of relativity is not valid. This problem has the following solution. As observed from the Moon the cosmic mass rotates. The rotating cosmic mass has to be included when the Moon observer solves Einstein’s field equations. Doing this he finds that the rotating cosmic mass induces the rotational nontidal gravitational field which is interpreted as the centrifugal field in Newtonian theory. This field explains to him why the Moon does not fall” (“Translational Inertial Dragging,” *General Relativity and Gravitation*, Vol. 21, No. 2, 1989, pp. 117-118). Regarding the feasibility of a rotating universe, **Yu. N. Obukov** found that there are no adverse effects: “…the analysis of its relation to Mach’s principle….there is a general belief that rotation of the universe is always a source of many undesirable consequences, most serious of which are timelike closed curves, parallax effects, and anisotropy of the microwave background radiation. The aim of this paper is…to show that the above phenomena are not inevitable (and in fact, are not caused by rotation)….As we see, pure rotation can be, in principle, large, contrary to the wide-spread

Although Einstein is supposing that the stars are "fixed" and that the Earth rotates, according to Relativity theory the above paragraph can just as easily be applied to a rotating star-system (the universe) around a fixed Earth. In such a case, the universe would be the "heavy shell of matter S," which, as it rotates, will create "an accelerative force" on the "mass enclosed by that shell," the "mass" being any heavenly body. The "accelerative force" is understood by Einstein to be the "Coriolis force," which is the force commonly cited to explain why "a Foucault pendulum" rotates. In other words, a universe of stars rotating around a fixed Earth will cause the peculiar movement of the Foucault pendulum just as a rotating Earth in a "fixed star" system. Like a leaf in a whirlpool, the pendulum would be carried around and around. It has inertia because it is caught in the gravitational draft of the stars' diurnal circular movement. In fact, under the heading "dragging of inertial frames," Misner, Thorne and Wheeler posit that the angular velocity of the Foucault pendulum would be equal to that of the rotation of the stars. They write:

> Consider a bit of solid ground near the geographic pole, and a support erected there, and from it hanging a pendulum. Though the sky is cloudy, the observer watches the track of the Foucault pendulum as it slowly turns through 360°. Then the sky clears and, miracle of miracles, the pendulum is found to be swinging all the time on an arc fixed relative to the far-away stars. If "mass there governs inertia here," as envisaged by Mach, how can this be?
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> Enlarge the question. By the democratic principle that equal masses are created equal, the mass of the Earth must come into the bookkeeping of the Foucault pendulum. Its plane of rotation must be dragged around with a slight angular velocity, ω_{drag}, relative to the so-called "fixed stars"….The distant stars must influence the natural plane of vibration of the Foucault pendulum as the nearby rotating shell of matter does, provided that the stars are not so far away…that the curvature of space begins to introduce substantial corrections into the calculation of Thirring and Lense. In other words, no reason is apparent why all masses

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prejudice that large vorticity confronts many crucial observations. In particular, the most popular claim that vorticity causes anisotropy of the microwave background radiation is apparently wrong…It is shear, not rotation, which is the true (and only) source of anisotropy of the background radiation" ("Rotation in Cosmology," *General Relativity and Gravitation*, Vol. 24, No. 2, 1992, pp. 121, 123-124).

> should not be treated on the same footing….Mach's idea that mass there determines inertia here has its complete mathematical account in Einstein's geometrodynamic law. "Point out, please," the anti-Machian critic says, "the masses responsible for this inertia." In answer, recall that Einstein's theory includes not only the geometrodynamic law, but also, in Einstein's view, the boundary condition that the universe be closed….This mass-energy, real or effective, is to be viewed as responsible for the inertial properties of the test particle that at first sight looked all alone in the universe.[240]

It would be no surprise to find the same reasoning in Einstein's thinking. I will interject explanations in brackets so the reader can follow Einstein's flow of thought in concrete terms:

> Let K [the universe] be a Galilean-Newtonian coordinate system [a system of three dimensions extending to the edge of the universe], and let K′ [the Earth] be a coordinate system rotating uniformly relative to K [the universe]. Then centrifugal forces would be in effect for masses at rest in the K′ coordinate system [the Earth], while no such forces would be present for objects at rest in K [the universe]. Already Newton viewed this as proof that the rotation of K′ [the Earth] had to be considered as "absolute," and that K′ [the Earth] could not then be treated as the "resting" frame of K [the universe]. Yet, as E. Mach has shown, this argument is not sound. One need not view the existence of such centrifugal forces as originating from the motion of K′ [the Earth]; one could just as well account for them as resulting from the average rotational effect of distant, detectable masses as evidenced in the vicinity of K′ [the Earth], whereby K′ [the Earth] is treated as being at rest. If Newtonian mechanics disallow such a view, then this could very well be the foundation for the defects of that theory…[241]

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[240] Misner, Thorne and Wheeler, *Gravitation*, pp. 547-549. NB: the authors cite the work of Thirring and Lense work of 1918 and 1921 (which Einstein also cited in his book *The Meaning of Relativity*).

[241] Hans Thirring, "Über die Wirkung rotierender ferner Massen in der Einsteinschen Gravitationstheorie," *Physikalische Zeitschrift* 19, 33, 1918, translated: "On the Effect of Rotating Distant Masses in Einstein's Theory of Gravitation." Three years later, Thirring made a correction and wrote the essay: "Berichtigung zu meiner Arbeit: 'Über die Wirkung rotierender ferner Massen in der Einsteinschen Gravitationstheorie,'" *Physikalische Zeitschrift* 22, 29 (1921),

In other words, Einstein has confirmed that a universe in rotation around the Earth would produce the same centrifugal and Coriolis forces attributed to a rotating Earth in a fixed universe. In essence, what Einstein attempted to take away with Special Relativity (to avoid the intractable problems precipitated by the Michelson-Morley experiment), he must now give back with General Relativity and admit that his entire scheme leads inevitably back to the "unthinkable" position that the Earth is immobile in the center of the universe.

Thirring's Geocentrism

Adding to the discussion, Misner, *et al.*, make reference to the work of **Hans Thirring** as offering support for their conclusions. In his 1918 paper, Thirring examined the motion of rotating bodies. His purpose was to determine how the universe, if it were a rotating shell, would affect movement on Earth (*e.g.*, Foucault pendulums, wind currents, weather satellites). Inadvertently, it provided Thirring with a mathematical model for a geocentric universe. Thirring found that objects would move as we normally see them move, but with an additional force pulling away from the center and thus opposite the pull of gravity. After five pages of tensor calculus, Thirring makes some preliminary conclusions, but with a new discovery. He writes:

> As one can see, the first terms of the X and Y components correspond to the Coriolis force, and the second terms correspond to the centrifugal force. The third equation yields the surprising result that the centrifugal force possesses an axial component.[242]

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translated: "Correction to my paper 'On the Effect of Rotating Distant Masses in Einstein's Theory of Gravitation.'" Thirring wrote: "Hence, over and against my original formula, the Coriolis force remains unchanged. However, a factor of 4/5 has to be included in the term containing the centrifugal force….The fundamental result of my paper (the appearance of centrifugal and Coriolis forces in the gravitational field of rotating distant masses) remains completely unchanged. H. Thirring, Vienna, October 15, 1920."

[242] *Ibid.*, p. 37.

The "axial component" is the force that pulls toward the equator and is in addition to the radial or outward force we normally associate with centrifugal force. (As we note below, it is the axial component that is now being associated with the recent discovery of "frame-dragging"). **Thirring** explains this "new" component as follows:

> As seen by an observer-at-rest, those surface elements of the hollow sphere which are nearest the equator have a greater velocity, and hence also a greater apparent (inertial and gravitational) mass than those about the poles. The field of a rotating hollow sphere of uniform surface density is therefore conformable to the field of a spherical shell at rest for which the surface density increases with increasing polar angle, θ. That is, points away from the equatorial plane are drawn towards the equatorial plane.[243]

In other words, being a believer in Relativity and preferring Copernicanism, Thirring attempts to explain the pull toward the Earth's equator by saying that objects near the equator attain more mass than objects at the poles since the former are moving faster, (*i.e.*, 1054 mph in Earth's rotation as opposed to practically zero rotation at the poles). Relativity proposes that objects in motion have more mass than immobile objects, thus, it is the "extra mass" in motion that is creating the axial centrifugal force.

Moreover, letting Relativity do its work, Thirring says that the above situation would be the same if the Earth were fixed and the surrounding rotating shell (*i.e.*, the universe) had the equatorial part of its shell possess a greater thickness than its poles. This is quite an inviting proposal to a geocentrist since it provides not only the cosmological origin of the axial component, but also a component for the origin of the force necessary for the universe to precess, or wobble, as it turns, thus creating the seasons and many of the other precessional phenomena we observe in the sky. The reason the tilt never accrues to more than 23.5 degrees is that the axial force keeps bringing the universe back to the equatorial plane, all such motion pivoting on the barycenter, the Earth.

As in all gyroscopes, the center of mass does not move, and thus the universe can rotate and precess without ever disturbing the Earth. This is so since all such forces, whether gravitational, centrifugal, or Coriolis, will act on the very center of the mass (in this instance, the very center of the Earth). As Newton himself noted about gravity, it is as if all the gravitational force is directed to the very center of the Earth. Anything that is materially and solidly attached to the center (as is the rest of the radius of the Earth) will likewise take part in the forces directed at the very center. Any temporary detachment, such as a shifting of the mantel from the core, may reveal itself in some kind of cataclysm at the surface (earthquake, volcano).

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[243] *Ibid*., p. 37. Thirring adds: "We also note in passing that it is easy to visualize that in the interior of such a hollow sphere of unequal surface density, forces appear analogous to the centrifugal forces."

Thirring goes on to state: "Finally, from equation 25 we can see that if body and sphere rotate in the same sense, then there results a reduction in the centrifugal and Coriolis forces."[244] That is, if both the universe and the Earth were rotating, the centrifugal and Coriolis forces would be less than they are presently. At first, Thirring thought he might have an error in his calculations, but as it turned out, the forces had the same magnitude as centrifugal and Coriolis forces (the same forces that Einstein spoke about as occurring in his rotating "heavy shell of matter"). As Thirring notes in his concluding remark:

> By means of a concrete example it has been shown that in an Einsteinian gravitational field, caused by distant rotating masses, forces appear which are analogous to the centrifugal and Coriolis forces.

Thus Thirring found what had eluded heliocentric mechanics since the time of Newton, that is, a physical explanation for centrifugal and Coriolis forces. The reason for this is obvious: Thirring included the mass of the universe in his calculations, whereas heliocentric mechanics limits itself to explaining force and movement to masses in the local system. In any case, Thirring discovered that centrifugal and Coriolis forces are caused by the forces in the universe, and thus they are outward gravitational forces. When a ball is swung on a rope, the reason the ball moves outward is that it is being attracted by the gravity of all the objects in the universe. (Newtonian mechanics has no physical explanation for the ball's outward tug on the string). The very act of rotation introduces us to the connection between the ball and the stars. Similarly, the reason a Foucault pendulum forms a parabola is not necessarily because the Earth underneath is rotating, but because the forces from the cosmos are dragging the free-moving pendulum. As such, Misner's, *et al.* appeal to Relativistic "frame dragging" to explain a particular motion is discounted in favor of a real and physical frame-dragging – that of the pendulum

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[244] *Ibid*. p. 39.

"frame" itself moved by the force of the cosmos against the fixed "frame" of Earth.

Recently NASA's Joint Center for Earth Systems Technology headed by Erricos Pavlis, along with Ignazio Cuifolini of the University of Lecce, made claims of confirming Einstein's General Relativity by measuring the long-awaited Lense-Thirring effect. The effect shows itself as a "precession of the satellite's node on the equatorial plane," and is said to be caused by the

> Earth's rotation…which curves space-time in its vicinity…creating 'mass' currents, in analogy to magnetic currents in electrodynamics….Our new result agrees with the GR theory to 99% ± 5%.[245]

These results, however, do not prove either General Relativity or a rotating Earth. In fact, as noted above, Thirring's original 1918 model theorized the universe as a rotating shell around a fixed-Earth as opposed to a rotating Earth in a fixed-universe. Thirring realized that in Einstein's theory "the required equivalence appears to be guaranteed by the general covariance of the field equations,"[246] and thus any claims that the additional force discovered by Thirring is proof of a rotating Earth is simply ignoring the very foundation of both Einstein's and Thirring's work. In fact, the Lense-Thirring effect leans toward a rotating universe since it is easier to see how the large mass of the universe would drag the matter inside of it as opposed to the small Earth trying to accomplish a similar task.

In any case, Thirring's tensor calculus revealed that there was an additional gravitational field (the axial component) caused by the rotation of the shell, although small enough that it had not been detected until the work of Pavlis and Cuifolini.

Joseph Lense joined Thirring and made more calculations, this time replacing the rotating shell by a rotating solid sphere, and still the same forces appeared.[247] The importance of the discovery is accentuated by the fact that Newtonian mechanics did not incorporate such a force. Consequently, since proponents of General Relativity understand Einstein's theory as filling in the gaps of Newtonian mechanics, it is natural for them to seek an explanation of the Lense-Thirring effect by recourse to Einstein's concept of "frame-dragging," thus positing that the supposedly rotating Earth was "dragging" part of the space-time continuum and thus producing a small force, which they then turned into "proof" of General Relativity.

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[245] Ben Chao, NASA Space Geodesy Branch, Code 926, Goddard Space Flight, Nov. 1, 2004. I. Ciufolini, E. C. Pavlis. "A Confirmation of the General Relativistic Prediction of the Lense-Thirring Effect," *Nature*, 431, 958-60, October 21, 2004.

[246] Thirring, p. 33.

[247] Joseph Lense and Hans Thirring, "Über den Einfluss der Eigenrotation der Zentralkörper auf die Bewegung der Planeten und Monde nach der Einsteinschen Gravitationstheorie," *Physikalische Zeitschrift* 19, 156-163 (1918), translated: "On the Influence of the Proper Rotation of Central Bodies on the Motions of Planets

In reality, however, the Lense-Thirring effect proved only that the movement of the surrounding object against its center creates a small force. Again, since Lense-Thirring found that the force created by the rotating object was directed away from the center, and thus opposite the pull of gravity, the larger forces would be analogous to the centrifugal and Coriolis forces that have long been without a mechanical explanation in Newtonian mechanics. This is why General Relativity had to borrow from Machian mechanics, saving face for the theory by mathematically creating the presence of "gravitational potentials" which supplied the forces that pulled away from the center of the object in view.

Interestingly enough, these results also coincide with the Michelson-Morley experiment and the remaining interferometer experiments up to Joos in 1932. Each of the interferometers found a small positive result, coinciding with an ether drift of about 1-4 km/sec. If this can be attributed to the rotation of the universe wherein the 1-4 km/sec is the residual drift of that which is much greater at the rim of the universe, we have the substance of the mechanical properties needed to transport the required forces. In other words, the rim of the universe (which is analogous to the "shell" in Lense-Thirring terminology) are the layers above the firmament which, in rotation, cause the centrifugal and Coriolis forces felt on Earth, and which are then transported from the rim to the Earth by the ether,

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and Moons According to Einstein's Theory of Gravitation." They write: "…the rotation of distant masses produces a gravitational field equivalent to a centrifugal field. From another perspective it seems interesting now, by the same means, to perform the not too difficult task of integrating the field equations for a rotating solid sphere. In the Newtonian theory one can exactly replace the field in the space surrounding a (stationary or rotating) sphere of incomprehensible fluid as equivalent to that of a point mass; but for a rotating sphere this is not the case. In the latter case…there appear supplementary terms corresponding to centrifugal and Coriolis forces" (p. 156).

detected in all interferometer experiments. Not knowing any better, Thirring tries to explain the previous undetectability of the centrifugal axial component by saying:

> The fact that in nature we only have been able to observe a radial, but never an axial component of the centrifugal force can be brought into agreement with the results obtained here by noting that the approximation of the heaven of fixed stars by means of an infinitesimally thin hollow sphere is certainly not physical.[248]

We maintain, however, that the "hollow sphere" is physical, and thus the recent discovery of the frame-dragging effect has a physical cause, not a "space-time" cause. The tremendous centrifugal forces created by the rotating universe are the forces that counterbalance the force of gravity. The centrifugal force is the weakest near the Earth and the strongest near the rim of the universe. Since gravity on Earth is not overcome by the centrifugal force, objects can cling to the Earth. But if an object on Earth reaches a certain speed (which we know as "escape velocity"), then it joins the centrifugal force. As such, the sun and planets are positioned so precisely around the Earth that the centrifugal forces balance the gravitational force and thus all the bodies remain in their balanced positions, and the balance is felt as inertia, by which they maintain the regularity of their orbits.

Lense and Thirring are not the only modern physicists and mathematicians to posit the plausibility of a fixed-Earth within a rotating universe. Granted, none of these scientists introduce their findings by stating they have accepted geocentrism as a scientific fact; rather, they affirm they have accepted the scientific principle that the same forces claimed for a heliocentric model can be applied equally well to a geocentric universe.

Rosser's Geocentrism

Strange to tell, the "unthinkable" geocentric universe finds rich support from the very theory designed to banish it once and for all, General Relativity. Consider, for example, one of the main objections raised by newcomers to geocentrism, that the Earth cannot rest immobile at the center of the universe since it would be impossible for the stars to revolve around the Earth at such tremendous speeds, speeds thousands of times faster than the speed of light. The common objection, which is based on Einstein's postulate, is: "Nothing can go faster than the speed of light." The answer to this objection often comes as a shock, but it is a fact nonetheless. First, according to Einstein's very own Relativity theory, the objection would only apply to Special Relativity, in the absence of a gravitational field (as noted earlier, even in that case, Einstein had to modify this tenet). According to Einstein's more advanced General Relativity theory, anything can go faster than the speed of light (a fact not often admitted by Relativists with a bias toward shutting out alternative models). Earlier we cited William G. V. Rosser addressing this concept, and it is worth repeating, since so many people are misinformed about what Relativity allows and disallows:

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[248] *Ibid.*, p. 38.

> Relative to the stationary roundabout [the Earth], the distant stars would have a velocity $r\omega$ [radius x angular velocity] and for sufficiently large values of r, the stars would be moving relative to O' [the observer] with linear velocities exceeding 3×10^8 m/sec, the terrestrial value of the velocity of light. At first sight this appears to be a contradiction…that the velocities of all material bodies must be less than c [the speed of light]. However, the restriction $u < c = 3 \times 10^8$ m/sec is restricted to the theory of Special Relativity. According to the General theory, it is possible to choose local reference frames in which, over a limited volume of space, there is no gravitational field, and relative to such a reference frame the velocity of light is equal to c. However, this is not true when gravitational fields are present. In addition to the lengths of rods and the rates of clocks the velocity of light is affected by a gravitational field. If gravitational fields are present the velocities of either material bodies or of light can assume *any numerical value* depending on the strength of the gravitational field. If one considers the rotating roundabout as being at rest, the centrifugal gravitational field assumes enormous values at large distances, and it is consistent with the theory of General Relativity for the velocities of distant bodies to exceed 3×10^8 m/sec under these conditions.[249]

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[249] *An Introduction to the Theory of Relativity*, William G. V. Rosser, 1964, p. 460, italics and comments in brackets added. Rosser adds: "Relative to an inertial frame the 'fixed' stars are at rest or moving with uniform velocity. However, relative to a reference frame accelerating relative to an inertial frame the stars are accelerating. It is quite feasible that accelerating masses give different gravitational forces from the gravitational forces due to the same masses when

As we noted earlier, Einstein admitted to this very principle, and some critics used it to posit a major contradiction between Special and General Relativity. Einstein writes:

> In the second place our result shows that, according to the general theory of relativity, the law of the constancy of the velocity of light *in vacuo*, which constitutes one of the two fundamental assumptions in the special theory of relativity and to which we have already frequently referred, cannot claim any unlimited validity. A curvature of rays of light can only take place when the velocity of propagation of light varies with position. Now we might think that as a consequence of this, the special theory of relativity and with it the whole theory of relativity would be laid in the dust. But in reality this is not the case. We can only conclude that the special theory of relativity cannot claim an unlimited domain of validity; its results hold only so long as we are able to disregard the influences of gravitational fields on the phenomena (*e.g.*, of light).[250]

As Rosser freely admits, General Relativity really has no choice in the matter. It must possess the inherent ability to make any point in the universe the center and produce coordinate transformations in accord with that center. Once it picks its center, then all the gravitational forces in the universe must balance. Hence, if an immobile Earth is chosen as the center, then all the forces in the universe will combine together such that,

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they are moving with uniform velocity. Thus the conditions in an accelerating reference frame are different from the conditions in inertial frames, since the stars are accelerating relative to the accelerating reference frame. It seems plausible to try to interpret inertial forces as gravitational forces due to the accelerations of the stars relative to the reference frame chosen." Einstein was criticized on this very point by Ph. Lenard in a 1917 open debate, later published in 1920. Lenard stated: "superluminal velocities seem really to create a difficulty for the principle of relativity; given that they arise in relation to an arbitrary body, as soon as they are attributed not to the body, but to the whole world, something which the principle of relativity in its simplest and heretofore existing form allows as equivalent" ("Allgemeine Diskussion über Relativitätstheorie," *Physikalische Zeitschrift*, 1920, pp. 666-668, cited in Kostro's *Einstein and the Ether*, p. 87). As an aside, Rosser also points out the following: "It has often been suggested that a direct experimental check of the principle of the constancy of the velocity of light is impossible, since one would have to assume it to be true to synchronize the spatially separated clocks" (*ibid*., p. 133).

[250] Albert Einstein, *Relativity: The Special and the General Theory*, authorized translation by Robert W. Lawson, 1961, p. 85.

when Einstein's field equations are employed to calculate the forces, they will balance out just as when Einstein employed them for a moving Earth. In other words, one can choose any center and reformulate the relative forces of the entire universe from the perspective of that particular center using the mathematics of General Relativity. This application is understood as the "strong" principle of Relativity. If such a reciprocal relationship did not exist between respectively chosen centers, then General Relativity would be falsified; and if General Relativity is falsified, then modern science lacks any answer to the experiments which have demonstrated both a motionless Earth (Michelson-Morley, *et al.*) and absolute space (Sagnac, Michelson-Gale, *et al.*), and we are back to geocentrism in any case. Hence, General Relativity has uniquely fulfilled the qualifications of the proverbial dog chasing its tail.

Bondi's Geocentrism

Like the rest of the physicists to whom we ascribe the word "geocentrism" in this chapter, Sir Hermann Bondi (d. 2005) would not refer to himself as a geocentrist. He, nevertheless, would be one of the first to admit that modern physics ably defends geocentric cosmology. This becomes abundantly clear in a 1994 paper Bondi wrote titled: "Angular Momentum of Cylindrical Systems in General Relativity."[251]

Bondi discovered two important facts from General Relativity that can be employed to defend geocentrism. First, Bondi derived and quantified what has been traditionally known as angular momentum, discovering in the process that the universe's cylindrical symmetry prohibits gravitational waves from carrying angular momentum. This finding resolves a critique of geocentrism which posited that, to conserve angular momentum, the universe would slow down if a mass is raised on Earth and accelerate if the same mass were lowered. Bondi showed that, according to General Relativity, this is not the case, and thus the criticism is neutralized. Related to the above, Bondi also discovered that, according to General Relativity, all the mass beyond the Schwarzschild radius (where the tangential speed of the universe exceeds *c*) can be ignored, since it will contribute nothing more to the frame dragging and centrifugal forces already present. He writes:

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[251] Royal Society Proceedings, Series A - Mathematical and Physical Sciences, vol. 446, no. 1926, July 8, 1994, pp. 57-66.

> The main point to note is that whereas in the newtonian, non-rotation of the reference system at infinity is taken for granted, in the relativistic treatment such rotation is permitted but irrelevant to the measure of angular momentum, which is an intrinsic characteristic of the material system….What is the nature of this limit? For such a cylinder the required angular velocity makes the tangential velocity at $r = r_2$ equal to the speed of light….Both the space drag on the core and *A* [angular momentum] will be unaffected by such outside layers….The conservation of *A* occurs even if gravitational waves are emitted by the cylinder. This is perhaps not surprising, since the cylindrical symmetry of the waves precludes their carrying angular momentum…. Therefore the intrinsic nature of the angular momentum of the inner becomes patent as it is wholly unaffected by anything that goes on outside. Thus there is no transfer of angular momentum between outer and inner.[252]

Bondi arrived at the above derivation a little earlier in his paper:

> It is a remarkable fact, discussed later, and of some relevance to Machian considerations, that this unique conserved measure of angular momentum appropriate to the symmetry imposed is independent of any superposed state of rotation.[253]

The same conclusion was stated in a different way in Bondi's abstract: "It emerges that angular momentum and space drag behave very differently as thicker and thicker spinning cylinders are studied."[254] Hence, from the perspective of General Relativity, Bondi makes geocentrism completely feasible. That is, if the argument against geocentrism that appeals to the conservation of angular momentum is valid, it would violate the strong principle of Relativity. To rescue Relativity theory from this failure, Bondi, by means of his meticulous tensor analysis, has simultaneously refuted the objection as it has traditionally been directed against geocentrism. The angular velocities used by Bondi are completely compatible with geocentric mechanics, since his analysis specifically validates cosmologies which have rotations at tangential velocities far greater than the speed of light.

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[252] "Angular Momentum of Cylindrical Systems in General Relativity Royal Society Proceedings," Series A - Mathematical and Physical Sciences, vol. 446, no. 1926, July 8, 1994, pp. 63-64.

[253] *Ibid.*, p. 61. My thanks to Martin Selbrede for bringing Bondi's paper to my attention, and his help in analyzing it.

The Lemaître-Tolman-Bondi Model

Another aspect of Bondi's teaching that makes geocentrism feasible is his development, along with Georges Lemaître and Richard Tolman, of the spherically symmetrical expanding universe.[255] Einstein's field equations allow at least two possible universes that were, more or less, diametrically opposed to one another: an isotropic homogeneous universe or an isotropic inhomogeneous universe. The former is the model that eventually developed into the Big Bang theory. As we noted earlier, such a universe will appear the same from every direction, and thus it has no center or distinguishing point. Today this model generally goes by the name of the Lemaître-Robertson-Walker model. But Einstein's field equations also allowed a spherical universe with a center, which was developed by Lemaître, and later by Tolman, Bondi and a few others. As we noted in Chapter 2 in the discussion of Stephen Hawking's "modesty," in a spherical universe with a center (and most likely with Earth in that very center), few Relativists admit the fact that Lemaître introduced a prior model. This model was non-homogeneous and isotropic, and thus it necessarily comprised a center, that is, a distinct place from which the view of the universe would be unique. This is commonly known among physicists today as the Lemaître-Tolman-Bondi model.

Astrophysicist George Ellis, who, we noted previously, advocated that the Earth is in a central location in the universe, affirmed the Tolman-Bondi model in his award-winning 1978 paper. His abstract states:

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[254] *Ibid.*, p. 57.

[255] Hermann Bondi, "Spherically Symmetrical Models in General Relativity," *Monthly Notices of the Royal Astronomical Society*, vol. 107, Nos. 5, 6, 1947, pp. 410-425. By "spherically symmetrical" Bondi means there is a center to the universe. He says as much in his paper: "We shall show that in our spherically symmetrical universe with the standard source at its center…" (*ibid.*, p. 413).

> It is shown that spherically symmetric static general relativistic cosmological space-times can reproduce the same cosmological observations as the currently favored Friedmann-Robertson-Walker universes, if the usual assumptions are made about the local physical laws determining the behavior of matter, provided that the universe is inhomogeneous and our galaxy is situated close to one of its centers.[256]

Ellis adds that only three things can lead us to conclude that the universe we live in is not such a static space-time spherically symmetric universe: "(i) unverifiable a priori assumptions, (ii) detailed physical and astrophysical arguments, or (iii) observation of the time variation of cosmological quantities" and concludes:

> …the standard models of a principle of uniformity (the cosmological or Copernican principle). This is assumed for *a priori* reasons and not tested by observations. However, it is precisely this principle that we wish to call into question. The static inhomogeneous model discussed in this paper shows that the usual unambiguous deduction that the universe is expanding is a consequence of an unverified assumption, namely, the uniformity assumption. *This assumption is made because it is believed to be unreasonable that we should be near the center of the Universe.* [Ellis adds footnote here citing Steven Weinberg's *Gravitation and Cosmology*, 1972].[257]

As we noted previously, the inhomogeneous models of the universe were being proposed mainly because too many problems were cropping up in the homogeneous models. Modern cosmology was, as the saying goes, 'caught between a rock and a hard place.' Accepting the homogeneous models would produce universes that would either explode or implode. If they accepted the inhomogeneous model, they also had to accept the distinct possibility of an Earth-centered universe, which was apt to be rejected on "philosophical grounds." To their consternation, cosmologists were producing very stable inhomogeneous universes, and doing so, ironically, with Einstein's field equations.[258] Yet, as Gerard de Vaucouleurs noted:

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[256] George F. R. Ellis, "Is the Universe Expanding?" *General Relativity and Gravitatio*n, vol. 9, no. 2, February, 1978, p. 87.

[257] George F. R. Ellis, "Is the Universe Expanding?" *General Relativity and Gravitatio*n, vol. 9, no. 2, February, 1978, p. 87. In a subsequent work, Ellis, et al., state: "The problem is that while isotropy is directly observable, homogeneity (on a cosmological scale) is not. In the standard discussions the assumption of homogeneity is made *a priori*, either directly, or in some equivalent form (*e.g.*, as the assumption that the Universe is isotropic for *all* observers), and so is not subjected to observational verification. Accordingly the standard 'proof' of the expansion of the Universe is based on an unverified *a priori* assumption" (George F. R. Ellis, R. Maartens and S. D. Nel, "The Expansion of the Universe," *Monthly Notices of the Royal Astronomical Society*, 184, 1978, p. 440).

> With few exceptions, modern theories of cosmology have come to be variations on the homogeneous, isotropic models of general relativity. Other theories are usually referred to as 'unorthodox,' probably as a warning to students against heresy. When inhomogeneities [read: theories that can lead to an Earth-centered universe] are considered (if at all), they are treated as unimportant fluctuations amenable to first-order variational treatment.[259]

Brill and Cohen's Geocentrism

In regard to the Schwarzschild radius and the Machian principle for geocentrism, Dieter R. Brill and Jeffrey M. Cohen write:

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[258] Summary analysis by Andrzej Krasinski, *Inhomogeneous Cosmological Models*, University of Cambridge Press, 1997; George A. Lemaître, *The Expanding Universe*, 1933 Ann. Soc. Sci Bruxelles A53 51 (French), reprinted in 1997 in *General Relativity and Gravitation*, 29, 641; Hermann Bondi, "Spherically Symmetrical Models in General Relativity," *Monthly Notices of the Royal Astronomical Society*, vol. 107, 410B, 1947; Richard Tolman, The Effect of Inhomogeneity on Cosmological Models, 1934 Proceedings of the National Academy of Sciences, 20 169, reprinted in 1997 General Relativity and Gravitation, 29 935; A. Krasinski A and C. Hellaby, "Structure Formation in the Lemaître-Tolman model," *Physical Review*, D65 023501, 2002; Guy C. Omer, Jr., "A Nonhomogeneous Cosmological Model," *The Astrophysical Journal*, vol. 109, 1949, pp. 164-176; Ronald Kantowski, "The Coma Cluster as a Spherical Inhomogeneity in Relativistic Dust," *The Astrophysical Journal*, vol. 155, March 1969; Gerard de Vaucouleurs, Science, "The Case for a Hierarchial Cosmology," vol. 167, No. 3922, Feb. 27, 1970; W. B. Bonnor, "A Non-Uniform Relativistic Cosmological Model," *Monthly Notices of the Royal Astronomical Society*, 159, 1972, pp. 261-268; Stamatia Mavrides, "Anomalous Hubble Expansion and Inhomogeneous Cosmological Models," *Monthly Notices of the Royal Astronomical Society*, 177, 1976, pp. 709-716.

[259] Gerard de Vaucouleurs, "The Case for a Hierarchial Cosmology," *Science*, vol. 167, No. 3922, 1970, p. 1204.

> "[T]here is general agreement that the dragging along of inertial frames by rotating masses is a Machian effect. In particular, for mass shells comprising more nearly *all* the matter in the universe than those treated by Thirring, Mach's principle suggests that the inertial properties of space inside the shell no longer depend on the inertial frame at infinity, but are completely determined by the shell itself….A shell of matter of radius equal to its Schwarzschild radius has often been taken as an idealized cosmological model of our universe. Our result shows that in such a model there cannot be a rotation of the local inertial frame in the center relative to the large masses in the universe. In this sense our result explains why the 'fixed stars' are indeed fixed in our inertial frame, and in this sense the result is consistent with Mach's principle"[260]

In this statement, Brill and Cohen agree with the above findings of Bondi concerning the irrelevance of the region beyond the Schwarzschild radius in determining inertial effects. But more importantly, they show that "there cannot be a rotation of the local inertial frame in the center relative to the large masses in the universe," which means either the shell of "fixed stars" must be fixed around a rotating center, or the center must be the fixed point for a revolving shell, since, as they say, "the result is consistent with Mach's principle."

Moon and Spencer's Geocentrism

The late M.I.T. professor Parry Moon and her partner Domina Spencer had been on the forefront of spelling out the unsettling implications of Relativity theory since their paper on Mach's principle first appeared in 1956. Not only did they perform experiments refuting Einstein's postulate on the speed of light, they demonstrated by the use of the concept of universal time that space must be explained in terms of Euclidean geometry.[261] Moon and Spencer also showed the disastrous implications for Relativity from both the 1913 Sagnac experiment and the 1924 Michelson-Gale experiment.[262] All in all, their findings left geocentrism as a viable concern, with no evidence to refute its plausibility.

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[260] Dieter R. Brill and Jeffrey M. Cohen, "Rotating Masses and Their Effect on Inertial Frames," *Physical Review*, 143, Issue 4, March 25, 1966, pp. 1012, 1014.

[261] Parry Moon and Domina Spencer, "Mach's Principle," *Philosophy of Science*, 26, 1959, pp. 125-35.

[262] Parry Moon, Domina Eberle Spencer and Euclid Eberle Moon, "The Michelson-Gale Experiment and its Effects on the Postulates of the Velocity of

Møller's Geocentrism

Just a few years before Moon and Spencer, C. Møller published his *The Theory of Relativity* which took Einstein's thought to its logical conclusion: what happens if instead of having the Earth rotate, we make the universe revolve around the Earth? Møller used a ring model instead of Thirring's shell but came to the same conclusion as Thirring: a universe moving around the Earth cannot be denied. He writes:

> …we may expect that a rotating spherical shell of uniform mass density will produce effects inside the shell similar to the rotation of the distant celestial masses….For a rotating shell of matter, however, Thirring found the interesting result that the field in the interior of the shell…is similar to the field in a rotating system of co-ordinates, thus leading to gravitational forces similar to the usual centrifugal and Coriolis forces. We shall here consider the somewhat simpler case of a rotating massive ring of rest mass M_0 and radius R, which is rotating clockwise in the xy-plane with angular velocity ω.[263]

He then concludes:

> …the above considerations suggest a connection between the gravitational constant κ, the total mass M in the world [universe], and the mean distance R of the distant celestial masses, of the type $M\kappa c^2/4\pi R \approx 1$. It is interesting that the dependence on the angular velocity of the gravitational forces inside a rotating shell is exactly the same as in a rotating system of reference.[264]

Perhaps frightened at the results, Møller excised them from his second edition published twenty years later, even though the Thirring model was widely available for public reading.

Light," *Physics Essays* 3, No. 4, 1990, pp. 421-428; Parry Moon, Domina Eberle Spencer and Shama Y. Uma, "The Sagnac Effect and the Postulates of the Velocity of Light," *Physics Essays* 4, No. 2, 1991, pp. 242-252.

[263] C. Møller, *The Theory of Relativity*, 1952, pp. 317-318.

[264] *Ibid.*, p. 320.

Brown's Geocentrism

Still in the same decade, G. Burniston Brown did something even more remarkable. Although it had been commonly thought that Newtonian mechanics supported only a heliocentric solar system, Brown showed how Newton's formulas serve the geocentric model just as well. Similar to Hoyle's analysis noted earlier, Brown sought to give an explanation of inertia "in terms of the total amount of matter in the universe and its distribution," which, we might add, is similar to the concept of a universal plenum appearing in various geocentric models. Brown then used this concept to explain other physical phenomena (red-shift, planetary perihelion, electromagnetic induction, etc.) by means of "non-instantaneous action-at-a-distance" (*e.g.*, force moving no faster than the speed of light). To find the origin of, and to calculate the inertial forces, Brown uses the geocentric model of a rotating universe revolving around a stationary Earth:

> …we can inquire into the problem of inertia. If this is not due to movement with respect to "absolute space," it ought to be due to surrounding matter, as suggested by Bishop Berkeley when criticizing Newton, and later by Mach. Now the evidence of astronomical observation at the present time is that the matter of the universe is distributed more or less uniformly, and to about the same distance in all directions. We must therefore consider the force on a moving body at the center of a spherical distribution of matter of uniform density ρ (dynamical units) and radius R. Using the postulate of physical relativity, we can take our particle of mass *m* [Earth] to be at the centre of coordinates, and the universe moving in the opposite direction.[265]

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[265] G. B. Brown, "A Theory of Action at a Distance," *Proceedings of the Physical Society* B, 1955, vol. 68, p. 676. Brown continues: "On calculating the force…we find that for a steady velocity the force of the universe on *m* is zero, but for an acceleration *f* there is an opposing force equal to $-(4/3)(\pi m \rho R^2/c^2)(f)$. If we take this to be the force of inertia and write m_1 for the inertial mass, we shall have $F = m_1 f = 4/3\ \pi \rho R^2/c2\ (mf)$. Thus the ratio of the attractive mass to the inertial mass of a body…should be given by $3c^2/4\pi\rho R^2$ or $G = 9c^4/16\pi^2\rho^2 R^4$. Taking $G = 6.7 \times 10^{-8}$ and $R = 2 \times 10^{27}$ cm [which is very close to Van Flandern's figure of 3.2×10^{27}cm] we can calculate the mean density of matter in the universe…which yields 10^{-27} g/cm^{-3}, a result which agrees with present estimates (Zwicky 1952)." Brown also realized that "Stellar aberration therefore confirms a very important fact: we know the one-way velocity of light" (Letter to a Mr. Stout, October 15, 1980, copy on file).

Nightingale's Geocentrism

About twenty years later, J. David Nightingale transposed the Einsteinian equation of Mach's principle in terms of classical Newtonian physics, demonstrating the viability of a fixed Earth in a rotating universe.[266] Another twenty years passed, and the science community was still employing the geocentric model to establish Mach's principle.

Lynden-Bell's Geocentrism

D. Lynden-Bell, J. Katz, and J. Bičák wrote a ground-breaking paper on the relation between inertial frames and angular momentum. They also refer to Lense and Thirring (1918) who, they say, "showed that, indeed, a rotating massive bucket many leagues thick [in answer to Mach's query] would drag around a Foucault pendulum…" They refer to the above paper by Brill and Cohen "who demonstrated that such dragging becomes complete when the radius of a massive rotating sphere reaches its

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[266] J. David Nightingale, "Specific Physical Consequences of Mach's Principle," *American Journal of Physics*, 1977, vol. 45, pp. 376-379. The Einstein equation of Mach's principle was stated in his 1956 book *The Meaning of Relativity*, 5th edition, formula 118, p. 102 as $d/dt\,[(1 + \sigma)v] = c^2\nabla\sigma + \partial A/\partial t - [v \times (\nabla \times A)]$ where $1 + \sigma$ inert mass (*i.e.*, the Earth); $\partial A/\partial t$ is the inductive action of a large accelerated mass (*i.e.*, the Universe); and the $[v \times (\nabla \times A)]$ represent the Coriolis force. Nightingale transposes this to the Newtonian formula: $d/dt\,[m_t (1 + \sigma)v] = m_t c^2 \sigma$ and finally $d/dt\,[(1 + \sigma)v] = c^2\nabla\sigma + (4GM/rc^2)f$, where f = acceleration of *M*. After working out the equations he concludes: "It is interesting to note that, if we take away the entire mass of the observable universe (10^{79} baryons?), which for the sake of argument is situated on a 'celestial sphere' of average radius *r*, we find….It would not be unreasonable to contemplate that the inertial mass of a small test particle [*i.e.*, Earth] could be entirely due to the mass of the observable universe...if *M* is taken to be the mass of the universe, the ratio of the accelerations is approximately 1:1. Thus, whatever wobbles the entire universe most certainly, according to Eq. 6 [$\ldots(4GM/rc^2)f\ldots$] wobbles us likewise." As Misner, Thorne and Wheeler demonstrated, in this sense the Earth will be held in position by the entire universe, and any attempt to move the Earth will first have to move the universe. Nightingale also anticipates the "frame dragging" effect predicted by Thirring and Lense as he demonstrates the mathematical results of a ring rotating around a small test object (*ibid*., p. 377). In the geocentric model these are attributed to "dragging" effects of the ether that holds the composite of all the forces generated by the rotating universe, and these components can easily be applied to Einstein's equation of Mach's principle noted above.

Schwarzschild radius. Thus Mach's question is fully vindicated."[267] The Machian principle was further reinforced by Lindblom and Brill (1974) concerning their work on a massive spherical shell in free fall, which investigation "showed the remarkable result that the inertial frame inside such an infalling slowly rotating shell rotates uniformly at each moment…consistent with Wheeler's (1964) interpretation."[268]

The Lynden-Bell team stresses several times their "general proof that the angular momentum of any closed universe is zero," which is to be expected in a spherical universe containing equal mass distribution. Interestingly enough, the null value for the angular momentum will provide the fixed and undisturbed cradle for the barycenter, the Earth, and thus Mach's principle has inadvertently vindicated geocentrism.

Immediately after the above relationship is established, Lynden-Bell then cite Embacher (1988) who "has demonstrated that both dragging and centrifugal effects occur with the correct ratio within systems of rotating cylinders."[269] In other words, even though the rotating universe generates no angular momentum to twist or rotate the Earth, it nevertheless generates other forces that are at work on the Earth's surface (*e.g.*, axial centrifugal force or "dragging effects"; radial centrifugal forces and Coriolis forces).

In the end, Lynden-Bell completely exonerate Mach's principle, at least, as they say, "if the universe is closed." In one of their concluding statements they write:

> Therefore motions in a closed universe do provide a complete determination of the h_0k. Thus the observable motions of the heavenly bodies do in this sense provide the inertial frame, just as Mach supposed. THIS IS OUR PRIMARY RESULT.[270]

Barbour and Bertotti's Geocentrism

Considering that Lynden-Bell's paper includes ten pages of the most rigorous mathematical analyses to date of Mach's principle (*i.e.*, that the universe in rotation around a fixed Earth equates to an Earth in rotation within a fixed universe), geocentrism has been established by the very physics that sought to dethrone it in 1905.[271] With all this evidence available, it is no surprise that **Julian B. Barbour** admitted in 1994: "all solutions of Einstein's equations are Machian,"[272] and it was Barbour's work with Bruno Bertotti in 1977 that was the foundation for his conclusion. In this work, Barbour and Bertotti propose that "neither Special or General Relativity fulfills Mach's ideal," and thus set out to demonstrate Mach's principle in a classical, pre-relativistic framework. As they do so, they invoke Leibniz's conception of physics since he, along with Mach two hundred years later, was critical of Newtonian dynamics based on the fact that physics is "ultimately concerned with the relations between things and not between things and abstract space."[273] They pointed out that Newtonian physics had an inherent problem answering the phenomena of the bucket of swirling water (since Newton resorted to saying the cause of the water's concavity was due to the unproven "absolute space").

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[267] D. Lynden-Bell, J. Katz, and J. Bičák, "Mach's Principle from the Relativistic Constraint Equations," *Monthly Notices of the Royal Astronomical Society*, 272, 150, 1995.

[268] *Ibid.*, p. 151.

[269] *Ibid.*, p. 151.

[270] *Ibid.*, p. 158, emphasis theirs.

> Mach's specific contribution was to suggest that the blatant contradiction…might be due to the presence of distant matter in the Universe. Thus, his conjecture, expressed in modern terms, was that a completely relational physics of the Universe considered as a whole could lead to an effective local physics…The present work shows, we believe, that this conjecture was completely correct and that the observed matter distribution in the Universe lends strong support to Mach's ideas.[274]

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[271] The working definition of "Mach's Principle" with which Lynden-Bell is working is the one taken from Hermann Bondi in 1952: "By Mach's principle we mean that: 'All motions, velocities, rotations and accelerations are relative. Local inertial frames are determined through the distributions of energy and momentum in the Universe by some weighted averages of the apparent motions'" (D. Lynden-Bell, p. 151).

[272] D. Lynden-Bell, p. 151. Bruno Bertotti was professor of Quantum Mechanics at the University of Pavia, Italy, and worked with Erwin Schrödinger at the Dublin Institute for Advanced Studies.

[273] J. B. Barbour and B. Bertotti, "Gravity and Inertia in a Machian Framework," *Il Nuovo Cimento*, 32B, 1:1-27, March 11, 1977, cited in "The Geocentric Papers," *Association for Biblical Astronomy*, Cleveland, Ohio. p. 88.

[274] Barbour and Bertotti, as cited in "The Geocentric Papers," p. 89.

After demonstrating through the use of Lagrangian derivatives the “invariant” component of Leibniz’s theory, and by assuming a non-rotating universe, the authors, by means of a Hamiltonian, find that “the Galileo group can be derived dynamically from the Leibniz group,” and thus they are successful in deriving: (a) Berkeley’s contention against Newton’s version of inertia; (b) Newton’s laws, albeit with a “small correction” to account for Mercury’s perihelion; (c) an answer to Kepler’s “cosmic coincidences” between the parameters of the universe and planetary motion; (d) a Machian reason why light’s speed is limited to a “critical velocity” [300,000 km/sec] in the local environment, which is said not to be due to “space-time,” but to the “imprint of the Universe on local physics.”[275] This “imprint” of the Universe the authors call *protophysics*.

To arrive at this final point, Barbour and Bertotti then present the case of a rotating universe around a fixed Earth. They can do so, of course, since there is no difference between a heliocentric or geocentric model in either Machian physics or General Relativity:

> Let us first consider the case when the massive body is a rigid, uniform shell of mass M_o and radius R_o [*e.g.*, the universe]. The test body [*e.g.*, the Earth] is near the center of the shell (coincident with the center of the cosmological shell and the origin of co-ordinates); thus $r_i << R_o$.[276]

Employing the Machian model the authors also derive the Lense-Thirring effect associated with General Relativity, but insist that: “our calculation is, however, superior from a Machian point of view: in our model the space outside the shell does not have any absolute inertial properties (they are determined by the cosmological shell).” In other words, unlike General Relativity, the Machian model isn’t measured by recourse to an absolute reference point outside the universe. The Machian mechanics are self-contained.

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[275] The authors add: “The averaged overall motion of the Universe is of necessity imprinted on local physics through its appearance in the ‘coupling constant’ $G = 4R\acute{R}^2/M$. In the framework of the theory we have developed, it is a remarkable coincidence that the magnitude of $\acute{R}$ is so close to the velocity of light. Nowhere has light entered into our considerations. This poses the following question: why does the local physics we observe around us have a distinguished velocity? The conventional answer is that the basic physical reality is space-time with a metric locally diagonalizable to the form (1, -1, -1, 1). This structure is assumed to be independent of the matter in the Universe. Our present work suggests quite a different explanation; it is that special relativity just reflects the imprint of the Universe on local physics.”

[276] *Ibid*., p. 98.

To finish off the analysis, Barbour and Bertotti employ another Machian example: "Now we consider an analogous example: a rotating sphere [*e.g.*, the universe] of radius *a* and mass *m* and a test particle [*e.g.*, the Earth] at a distance $r >> a$ from it [many light years in distance]." After running it through their working equation, the authors find:

> [T]he first term of our theory: the gravitational action of a finite, spherical body at rest is not the same as if its mass were concentrated at the center, as happens both in Newtonian physics and in general relativity…. The last term amounts to a small…increase of the gravitational constant…the internal motion mechanism, which of necessity leads to attractive gravity, explains gravity in a way radically different from all other theories.[277]

And so, Barbour and Bertotti's work has not only advanced Machian mechanics from a mere theoretical concept to a rigorously supported mathematical system, but has also led to some startling principles of physics that were heretofore unknown, and which answer a variety of issues much more easily than the heliocentric model.[278]

The Problem of Earth's Diurnal Motion

Although an Earth in diurnal motion provides Copernicans with a viable mechanical model of the movements of the solar system, it also creates various anomalies. One of these regards the effect of the tides on the rotation of the Earth. According to evolutionary cosmology, the Earth's spin has been steadily decreasing over the 4.5 billion years it has been in existence and has now reached the point that it rotates once in 24 hours. The main cause for this slowdown is said to be the tidal action of the Earth's oceans, which causes a drag on the rotation. As popular astronomer Fred Hoyle describes it:

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[277] *Ibid*., p. 98.

[278] We can add to this the findings of Joseph Rosen, stating, "…small subsystems of the universe contribute relatively little to the total action….We can take a further step and state that the existence of $L_1(U_0u)$ that we just proved, is a formal statement of the extended Mach principle. The statement that the evolution equations for tiny isolated systems are determined by $L_1(U_0u)$ via Hamilton's principle implies that the laws of physical properties of the raw material of which such system consist, are indeed determined by the whole universe, since $L_1(U_0u)$ is so determined" (*American Journal of Physics*, Vol. 49, No. 3, March 1981, p. 263). This again shows the viability of a geocentric universe. Theoretical physicists must accept this outcome since otherwise the laws of physics would then depend on one's location in the universe.

> In the past the Earth rotated considerably more rapidly than it does now: at the time of its origin the cycle of day and night may have been as short as 10 hours. The spin of the Earth must accordingly have been slowed down during the 4,000 million years or so that have elapsed since the early period of its life. The agency responsible for the braking action is known. It is just the twice-daily tides that are raised by the Moon and the Sun. The oceanic tides cause a frictional resistance when they impinge on the continental margins. This friction produces heat at the expense of the energy of rotation of the Earth, thereby slightly slowing the Earth's spin. In return for its effect on the Earth, the Moon experiences a force that pushes it gradually farther and farther away from us.[279]

So here we have two problems, and both, any mechanic might agree, are due to the fact that the more moving parts a machine contains, the more chance exists that something can go wrong. The Copernican system requires the Earth to possess a double movement (diurnal and translational) that must be in lock-step with the rest of the solar system and the universe at large. That's quite a demand on a little planet seeking to preserve its delicate balance of life. The geocentric system is much simpler, requiring no effort from the Earth, least of all a double-effort, to keep pace with the universe, and thus little chance for it to upset its own environment. The only thing necessary is that the giant wheel of the universe keep turning, but its sheer mass makes this rotation almost effortless under the laws of inertia. The tides would not slow down the universe's rotation around Earth anymore than a drop of water would make the level of the oceans rise. Not so in the heliocentric system. The need for a rotating Earth not only puts an inordinate amount of pressure on the tiny planet to keep pace with the universe, it will cause tremendous stresses and strains on all the Earth's components. Earth must now adjust to, and compensate for, all the stresses and strains associated with movement, not the least of which is keeping the Earth in a complicated double motion. If, as Hoyle suggests, the tides slow the Earth's rotation, we should be able to measure this decrease year by year, no matter how small it is, for there is nothing magical about rotation that it should suddenly be satisfied when it reaches a 24-hour threshold.[280] We can take a wild guess that Copernicus didn't think of these problems when he proposed his heliocentric system to correct the calendar.

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[279] *Frontiers in Astronomy*, pp. 15-16.

The second problem (which seems to have slipped Hoyle's mind since he doesn't attempt an answer) is that if the moon has been steadily departing from the Earth during the same time the Earth has slowed from a 10-hour per day rotation to one of 24-hours over the last "4,000 million years," then the moon must be much farther away from us now than it was several million years ago. In fact, using lasers, we know precisely how much the moon falls out of its orbit – to the tune of 4 centimeters per year.[281] That might not seem like much, but when you add up the decay over the time span Hoyle has proposed, it means the moon (assuming the same uniformitarian environment that scientists assume for their coveted theory of evolution), would have increased its radial distance by 16 billion centimeters in the course of "4,000 million years" (give or take a few million to account for the fact that the moon, according to solar evolutionary theory, may not yet have been in existence when the Earth was first formed). Still, in 4 billion years this amounts to 99,416 miles, which is about 40% of the moon's current distance from Earth. If we use evolution's current estimates of the Earth's age, the numbers are even greater, since 4.5 billion years yields 111,843 miles or 47% of today's Earth-moon distance. These calculations are based on an arithmetic proportion, but they might just as well be based on a geometric proportion, since physical laws would require the moon's recession in past time to have been more than 4 cm/year. In fact, the calculus shows that just 2 billion years ago the moon would have been less than 25,000 miles from Earth, and orbiting 3.5 times per day, thus causing tides at least a million times greater than they are today.[282] Moreover, when the Earth was rotating once every 10 hours or so, in between the massive flooding caused by the moon's close proximity, such intermittent levels of light and darkness, exorbitant temperature fluctuations, and many other extreme environmental factors, would wreak havoc on the tender ecosystems that make life possible. Suffice it to say, none of these parameters are conducive to supporting life on Earth, especially in the uniformitarian environment upon which evolution so heavily depends.[283]

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[280] K. E. Veselov adds that: "It is an established fact that over the past 25 years the rotational speed of the Earth has been slowing down and changing with a one-year period. The duration of the diurnal period has during these years been increasing at an average rate of 12.5×10^{-3} second/year…the longitudes of the perihelia of the planets anomalously shift in 100 terrestrial years over appreciable distances….Tidal friction inside the Earth can account for only about one-sixth of the retardation of its rotation. Accordingly, the value of that retardation for the past 25 years obtained experimentally by employing atomic timing devices is simply dismissed as anomalous" ("Chance Coincidences or Natural Phenomena," *Pushing Gravity*, pp. 169-170).

[281] NASA puts the recession at 3.8 cm/year ("Moon Slipping Away from Earth," *Geo*, Vol. 3, July 1981, p. 137). Current science holds that the moon is losing kinetic energy as it daily transfers mega watts of energy into the Earth's oceans (Gary D. Egbert and Richard D. Ray, "The Motion in the Ocean," *Nature*, July 15, 2000, p. 42).

Of course, Hoyle's bigger problem is trying to explain how, if the tides are continually producing a braking effect on the Earth's rotation, the Earth can now sustain a rotation period of 24-hours, especially if in the past it decreased from a 10-hour per day rotation. Here is Hoyle's solution:

> Now the atmosphere of the Earth oscillates up and down….Not only this, but the atmosphere is pushed by the same forces as those that raise the oceanic tides…But the force due to the Moon…does not act in resonance with the oscillations of the

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[282] Current science tries to explain this anomaly by suggesting that tidal forces were less than they are today. Bruce Bills and Richard Ray state: "The torques were therefore correspondingly smaller than they would otherwise have been if the admittances had maintained their present day values" ("Lunar Orbital Evolution: A Synthesis of Recent Results," *Geophysical Research Letters* 26, 19: 3045-3048, October 1, 1999, p. 3046; also B. A. Kagan and N. B. Maslova, "A stochastic model of the Earth-Moon tidal evolution accounting for the cyclic variations of resonant properties of the ocean: An asymptotic solution," *Earth, Moon and Planets* 66: 173-188, 1994; and G. E. Williams, "Geological constraints on the Precambrian history of the Earth's rotation and the Moon's orbit," *Reviews of Geophysics* 38, 1: 37-59, February, 2000. All these explanations, however, are quite self-serving since they choose parameters that conveniently fit into an Earth/moon age of 4.5 billion years. They also fail to account for the additional braking effect that higher tides would have caused, as well as the additional effect the Earth would have had on the moon when their distance was closer and the Earth was spinning faster.

[283] Veselov adds: "In 100 terrestrial years the Moon should turn in relation to the Earth by 372 seconds of arc, and in 1000 years, by 37220 seconds, *i.e.*, by almost one-fifth of its radius. Apart from the secular shortening of the period of the Moon's revolution around the Earth by 0.0009 seconds a year, there should be periodic changes of that shortening with an amplitude of 0.0052 seconds, periodic changes of the duration of the rotational period by 0.052 seconds, and a swaying of the pericenter by 0.21 seconds….The change in the periods of the revolution of the sixth and seventh satellites of Jupiter is of the order of 0.002 sec/terrestrial year, and the rotation of the pericenter longitude of Amalthea amounts to approximately 2000 seconds per 100 terrestrial years… ("Chance Coincidences or Natural Phenomena," *Pushing Gravity*, p. 181).

> atmosphere and consequently does not build up appreciable motions of the atmospheric gases. The somewhat weaker pushes due to the Sun do act in resonance with the atmosphere, however. The result is that very considerable up and down motions of the air are set up. These motions are accompanied by oscillations of pressure….The variations occur twice daily, just as the oceanic tides do. The pressure is found to be at a maximum about two hours before midday and about two hours before midnight. By a careful calculation it can be shown that this precedence of the atmospheric tides before midday and midnight cause the gravitational field of the sun to put a twist on the Earth tending to speed it up…the twist is comparable with the slowing-down effect of the oceanic tides, just as Holmberg's theory requires it to be.[284]

So here Hoyle attempts to give us the impression that this system is as precise as a clock. After all, "two hours before midday and about two hours before midnight" this adjustment by the sun takes place "by a careful calculation," so we need not worry that our sleep habits will ever be disturbed. Then again, the clock Hoyle envisions has only relative precision, for he then adds that the results are only based on "the law of averages":

> It is important to realize that the speeding-up process need not exactly compensate all the time for the slowing-down effect of the oceanic tides. It is sufficient if the two processes compensate each other on the average, averages being calculated over say a time of 100,000 years. Indeed exact equality at all times is not to be expected for the reason that the slowing effect is likely to vary quite appreciably and quickly from one time to another….But now here is the crucial point. As the Earth slowed to a day of 24 hours the pushes of the Sun gradually came into resonance with the oscillation of the atmosphere….This went on until the speeding-up process came into average balance with the slowing

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[284] *Frontiers of Astronomy*, pp. 16-17. Without any explanation or proof why Holmberg's theory would do so, Hoyle adds that Holmberg's "very recent theory…disagrees that the cycle of day and night will ever take longer than 24 hours in the future." It is rather amazing how Hoyle puts such trust in a "very recent theory" to explain such a crucial part of his Copernican universe, yet all without the slightest proof to the reader. We are to take it on Hoyle's word that Holmberg has it all worked out, and no further inquiry is required.

> effect of the oceanic tides. A state of balance has been operative ever since.[285]

Now if the effect of speeding-up produced by the sun can "vary quite appreciably and quickly," yet tidal action occurs twice daily without fail and always has the effect of slowing down the Earth, should we not experience at least a fraction of this difference in our present day? No, Hoyle assures us, this process magically reached a "state of balance" by the time we humans reached a point of evolutionary cognition, and we can now work backwards, as it were, and figure out that our hominid ancestors did not enjoy eight hours of nocturnal sleep as we humans do. This is a good example of what Van der Kamp calls "that invalid theoretical syllogism, the *modus ponendo ponens*."[286] Such self-serving cosmological models, propped up by nothing more than anachronistic logic and a "very recent theory" are common in the modern Copernican world. Although Hoyle is seeking to salvage the Copernican system, the laws of physics simply will not allow him to ignore the braking effect of tidal action, so he must have another mechanism to compensate for the anomaly that tidal action creates for a 24-hour rotation. The sun, which, previous to the anomaly, is understood as that solitary force which inhibits the Earth's wish to fly off into space, is now assigned to give an opposite force in order to make the Earth rotate faster, and just enough so that it doesn't disturb the 24-hour cycle. What incredible powers of discretion this sun possesses! Of course, no such contradictory forces, fine-tuning, or "law of averages" exist in the geocentric model, for there isn't a force in the cosmos, including tidal forces, that can stop the gigantic ball of the universe from rotating once it is given its initial push. It will be as precise as a Swiss watch, from now until doomsday, and without all the moving parts working against each other.

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[285] *Ibid.*, p. 17.

[286] *De Labore Solis*, p. 28. Van der Kamp writes: "If situation P is the case, we agree, then we shall observe the phenomenon Q. Now indeed we observe Q. Does it therefore follow that P is the factual state of affairs? By no means necessarily, for Q may be caused by a variety of other circumstances. As one of my textbooks of logic remarks: 'We shall have frequent occasions to call the reader's attention to this fallacy. It is sometimes committed by eminent men of science, who fail to distinguish between necessary and probable inferences, or who disregard the distinction between demonstrating a proposition and verifying it.'"

"…it might seem that if we observe all other galaxies to be moving away from us, then we must be at the center of the universe….There is, however, an alternate explanation….We have no scientific evidence for, or against, this assumption. We believe it only on grounds of modesty"

Stephen Hawking[287]

"Scientists have ideological positions just like everyone else, especially in conflicted situations, and sometimes the consequences are bizarre."

Robert B. Laughlin[288]

"Equations, however impressive and complex, cannot arrive at the truth if the initial assumptions are incorrect."

Arthur C. Clarke[289]

"Then I would feel sorry for the good Lord. The theory is correct anyway."

Albert Einstein[290]

"He who puts the cart before the horse can at best proceed backwards."

Walter van der Kamp[291]

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[287] Stephen Hawking, *A Brief History of Time*, 1988, p. 42.

[288] *A Different Universe*, p. 50.

[289] Arthur C. Clarke, *Profiles of the Future: An Inquiry into the Limits of the Possible*, 1963, 1984, p. 21.

[290] In answer to the question of doctoral student Ilse Rosenthal-Schnieder, in 1919, about how he would have reacted if his general theory of relativity had not been confirmed experimentally that year by Arthur Eddington. Quoted in Rosenthal-Schnieder, *Reality and Scientific Truth*, p. 74, as cited in *The Expanded Quotable Einstein*, Alice Calaprice, 2000, p. 238.

[291] *Bulletin of the Tychonian Society*, November 1982, p. 14.

Chapter 10

Technical and Summary Analysis of Geocentrism

Dr. Robert Bennett

In this chapter we will analyze the arguments for geocentric cosmology with more detail and technical analysis, including the corresponding mathematical equations, charts, graphs, pictorials and technical points. To begin, there are three geokinetic claims for terrestrial motion:

1) Spin claim: Earth rotates around the polar axis every day
2) Heliocentric claim: Earth moves around the Sun every year.
3) Cosmic Linear claim: Earth translates as part of a cosmic group: solar system, galaxy, local group of galaxies, etc.

We will cover each of these three claims in the following analysis.

Part 1: Does the Earth Rotate?

First we will analyze (1): the geokinetic claims that the Earth is spinning daily around its polar axis with respect to the fixed stars.

The Geokinetic Claim

All claims center on the inertial forces called centrifugal and Coriolis that explain the following effects and others based on the presumption of Earth's rotation:

1) Coriolis forces produce an East to West motion in projectiles, pendula and atmospheric winds. The Foucault pendulum and weather cyclones are examples.

2) Centrifugal forces cause the water and air near the equator to rise as inertial effects of the Earth's rotation – the polar flattening and equatorial bulge. This also explains why the acceleration of gravity is less at the equator.
3) The Sagnac effect used in laser gyroscopes and the precession of mechanical gyrocompasses indicate the Earth is spinning. Tidal braking of rotation causes the occasional adding of 'leap' seconds to the standard year.

Claims and Responses

Claim: The Earth's rotation causes the inertial effects that surround it, the Coriolis and centrifugal pseudo-forces. If the Earth did not spin, these forces would not be present.

***Response**: All the various effects noted above depend on the assumption that the inertial effects can only be caused by the Earth's rotation. Implicitly denied is the equally valid premise that the rotation of the external world, the universe, can cause the very same inertial forces – centripetal and Coriolis. That premise is known as Mach's Principle. Mach's idea can be stated as:*

> The inertia of any system is the result of the interaction of that system and the rest of the universe. In other words, every particle in the universe ultimately has an effect on every other particle.

According to Mach, the Earth in an empty universe would feel no inertial forces. Without any external reference it would be impossible to determine whether that object is rotating or not. Mach said the inertial forces on the Earth are caused by the sum of the gravitational forces from cosmic bodies such as the distant stars; the rotation of the Earth only makes sense relative to these cosmic objects.

Barbour and Bertotti proved that a large hollow sphere (representing the distant star fields) rotating around a small solid sphere inside (modeling the Earth) produced exactly the same pattern of Coriolis and centrifugal forces that are claimed as proof of Earth's spinning in space. If the hollow shell of matter accelerates or rotates, any object inside the shell will tend to be carried along with the acceleration or rotation to some extent. But they note this all-important fact: An object at the center of the hollow sphere will not be affected by the inertial forces. The space around the Earth will exhibit the inertial effects of the distant sphere, but not the Earth itself, if it is centrally located.

From Mach's principle we can conclude that inertia is a universal property, like gravity. But in Mach's principle the conventional interpretation of distant masses as causing inertial effects around the Earth is too restrictive. The cause of inertia could also logically be the properties of the space around each object, modified by the presence of the mass in or around that space. In other words the ether/firmament may be the source of inertia, which causes the gravity and inertial effects on bodies embedded in the ether. The ether's properties are changed by the masses (via feedback), but it is the ether that is the primary or first cause. Linear inertia is the resistance to an actual or attempted change in motion of objects moving linearly caused by the ether drag.

Einstein was intrigued by, but ambiguous about, Mach's principle. This is strange, because Mach's principle states a principle of relativity for rotation, similar to Special Relativity's assertion concerning relative linear motion. An inconsistency with relativity would arise if rotational effects were not reciprocal. Distant masses would be discounted as a potent source of inertia.

No measurement of absolute or preferred rotation has been made to test whether the Earth is rotating or its surroundings. Until such a test is performed, Mach's principle is a valid statement; it has not been disproven experimentally. It is only a hurdle in the minds of those who wish it were not so.

A Simple Model

The technical explanation of gravitational and inertial forces surrounding the Earth depends on the physical concept of a field that fills the space between the interacting objects. Although the field is expressed mathematically as a function, for simplification we can picture it as invisible lines of force that terminate on the bodies, taking the Earth as one object and the rest of the universe as the other. If neither the Earth nor the universe rotated, then gravity lines from the Earth would be only vertical from the surface and there would be no inertial forces. If the Earth spins and the stars do not, then the vertical lines will be bent to produce the observed rotational effects of inertia. The picture is now of spiral or vortex lines surrounding the Earth, visually expressing the presence of horizontal inertial forces. The greater the rotation, the greater the deflection of the gravity lines sideways. Using the field concept of force lines allows us to picture how an object moving above the Earth knows that the Earth is rotating beneath it. All of this is conventional physics, for which there is no dispute.

Conventional physics, however, claims this is the *only* model of rotational reality. It does this by ignoring role reversal – the consideration that the Earth could be at rest and the stars in rotation around it. Logically, the gravity lines, like a string, have two ends. One end is at the Earth's surface and the other on one of the distant stars. If the remote stars rotate, their gravity lines connected to Earth will also bend, creating the same spiral pattern as when the Earth rotates. This model will explain the measured inertial forces just as well as the rotating Earth model. To satisfy the scientist, this visualization of relative rotation must have formal mathematical support, or what is known as a "formal proof."

Formal Proof

Newton's concept of absolute space pictured the fixed star shell as being approximately at rest as viewed from Earth. Newton sought to test his concept of absolute space using a water bucket to simulate the Earth in rotation. When the water in the bucket was not in rotation, the surface would be flat, since there were no centripetal inertial forces present. When the water rotated, centrifugal forces would push the water surface up the bucket sides to form a parabola. This was a simple but crude way of detecting rotation, equivalent in purpose to the present day optical gyroscope. Since Newton's absolute space was thought to be unobservable, only rotation with respect to the fixed star shell could curve the water surface. Newton thought that if the Earth were not rotating with respect to his absolute space, the water surface would be flat. There would be no inertial forces.

Berkeley and Mach held a contrary view. From their geometrical point of view, it matters not if the Earth is rotating and the star shell is at rest, or the converse. The same forces of inertia (Coriolis and centrifugal) exist for both. Mach's geometrical point of view was that relative rotation was reversible; it does not matter if the Earth is rotating and the star shell is at rest, or the stationary Earth is surrounded by the rotating star shell. Newton's mechanics is asymmetric but Mach said that a correct theory of mechanics should not break the symmetry of rotational viewpoint. Newton's equations have physical meaning only with the existence of the fixed star shell. The fixed star shell is needed to establish when centrifugal forces will be produced.

This leads us to the premises of the formal proof:

1. The Earth rotating uniformly with respect to the stationary star shell with angular velocity ω produces forces of inertia (*i.e.*, Coriolis and centrifugal forces).

2. The star shell uniformly rotating with respect to the stationary Earth with angular velocity $\boldsymbol{\omega}$ produces a constant homogeneous, vector, magnetic-type gravity (MTG) or gravitomagnetic field, described by the vector potential

$$\mathbf{A} = (\mathbf{B} \times \mathbf{r})/2$$

where **B** is gravity's induction vector (not the magnetic field). The vector cross product indicates that the MTG field is orthogonal to both the position vector **r** and **B.**

What we must prove:

The equation of motion of a body in a spherically symmetric gravity field and in constant homogeneous MTG (magnetic-type gravity) field, described by means of **A**, is exactly the same as an equation of motion for this body in the same gravity field in the coordinate system uniformly rotating with respect to the stationary fixed star shell with $\boldsymbol{\omega} = (\mathbf{B})/2$.

The Lagrangian for the inertial body with an Earth spinning at $\boldsymbol{\omega}$ and the fixed star shell is:

$$\mathcal{L} = (m/2)\mathbf{v}^2 + m\mathbf{v} \cdot (\boldsymbol{\omega} \times \mathbf{r}) + (m/2)(\boldsymbol{\omega} \times \mathbf{r})^2 - mV$$

$V = GMe/r$ = gravity potential; Me = Mass of Earth

The variational equation of motion is:

$$d(m\mathbf{v})/dt = -2m(\boldsymbol{\omega} \times \mathbf{v}) - m[\boldsymbol{\omega} \times (\boldsymbol{\omega} \times \mathbf{r})] + m\mathbf{E}$$

where $\mathbf{E} = -\mathbf{grad}V$, $-2m(\boldsymbol{\omega} \times \mathbf{v})$ is the Coriolis force, $-m[\boldsymbol{\omega} \times (\boldsymbol{\omega} \times \mathbf{r})$ is the centrifugal force. The Lagrangian for the inertial body "m" with a star shell spin of $\boldsymbol{\omega}$ and the Earth stationary is:

$$\mathcal{L} = (m/2)\mathbf{v}^2 + m\mathbf{v} \cdot \mathbf{A} + (m/2)\mathbf{A}^2 - mV: \quad V = GMe/r$$

The variational equation of motion is:

$$d(m\mathbf{v})/dt = -m(\mathbf{v} \times \mathbf{B}) - m/4[(\mathbf{B} \times \mathbf{r}) \times \mathbf{B}] + m\mathbf{E}$$

If the condition for relative rotation is chosen, $\boldsymbol{\omega} = \mathbf{B}/2$, the motion equations in both views are identical.

Physical Constituents of a Geocentric Universe

Key preliminary concepts

- Ether
- Parallax vs. aberration
- Parallax vs. transit delay
- General covariance
- Occam's razor

Definition of Ether

Ether (a) fills all space, (b) is more rigid than steel, (c) is more flexible than any known substance. These three properties allow connection to be made between ether and the Genesis firmament (Gn 1:6-9), which has the following characteristics as noted in the text analysis.

- Ether is the medium for propagating electromagnetic waves.
- Ether is a "less dense" (lacking a definition, an appeal to physical intuition) material form of matter, a fluid of photon quanta.
- Light speed is only constant in relation to the medium and its properties, such as density.
- The density of ether is related to gravity as Einstein's view of the solar eclipse is related to the bending of light through air of differing temperatures.
- Ether can be dragged along – entrained – with matter, proportional to Fresnel's drag coefficient.
- Modern cosmology's invention of Dark Matter is the result of its dismissal of a pervasive universal ether and the differing densities of ether.

Possible Suppositions/Conclusions

The possibility of ether-matter drag provides the reason for very small measurements from precise interferometer experiments. Ether might have a liquid crystal structure to account for transverse wave propagation. The transmission of energy and radiation is affected by the density and flow of ether.

Types

1) Electromagnetic or luminiferous: the only one treated here.
2) Gravitational or ponderomotive: related directly to the firmament, but left undeveloped as a very broad topic.
3) Merits future detailed exposition. Static Magnetic: may be related to the other two

Modern possibilities

(a) The zero point energy (ZPG) and fluctuations (ZPF) of the quantum vacuum
(b) The vast sea of neutrinos
(c) The virtual particles of quantum field theory
(d) Particles of Planck length
(e) The EPOLA - an alternating lattice of electrons and positrons (see: Theories of the Ether[292])

Zero drag: Ether that is totally unaffected by a gravitational field is called "unentrained," meaning without any drag or friction. Objects like the Earth would move through ether without dragging any along. The unchanged flow of ether through the Earth (or vice-versa!) would allow Measurement of any motion around the Sun (revolution) or spin (polar rotation). As will be shown, the Michelson-Morley experiment was able to detect such an ether wind of revolution at 0.01% of ***c*** and a small non-null result was found, but not to the level expected for an unentrained ether.

Partial drag: If the ether is partially entrained, Earth's gravity field would make it denser at the Earth's surface than at higher altitudes, similar to the atmospheric density variation. The partially dragged ether would be traveling at a fraction of the Earth's revolution speed. A small level of drag would produce a small but non-null change in the relative velocity between the Earth and the ether. Detection of this small change by any laboratory experiment, like the Michelson-Morley experiment, would depend on the instrument sensitivity.

Total drag: Complete entrainment of the ether by the Earth is a special case of partial dragging, with the dragging factor equal to 1. No relative motion between ether and earth will be detected, since the ether is moving (being dragged) at the same speed as Earth's speed.

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[292] http://www.mountainman.com.au/aether.html.

Models: Picture still water as ether and a swimmer as a light photon. When riding in a boat, a person moves with the speed of the boat. Diving into the water (ether) the swimmer (photon) can only swim at his physical limit. Once out of the boat the swimmer has the speed and direction of the dive, which is independent of the boat's velocity. If the water gets muddy (thicker), the swimmer's speed slows according to the density of the water (ether). The ether thus determines light speed, not the velocity of the source.

As an analog of drag in an elastic/flexible ether, consider a car's motion through air, with the car modeling the Earth and the ether. If the road serves as an absolute reference frame – an alternative form of a rigid and immobile ether – the speedometer always measures the true absolute speed of the car along the road (*i.e.*, Earth with respect to the absolute frame).

- No drag: an open convertible - the air streams past the driver with no interaction - the air stream measures the true car speed.
- Partial drag: car with a window open - some of the air is trapped inside and forced to move with the car.
- Total drag: all windows are closed - all the air is forced to move with the car.

History of Light and Ether

Newton's particle theory of light explained reflection but not wave phenomena, such as refraction and diffraction. He proposed the existence of an "ethereal medium" – simply called ether - with these properties:

- it supported vibrations faster than light.
- its particles are much smaller than those of air or the light particles.
- much thinner and flexible than air.
- offers little resistance to object motion (friction).
- able to exert pressure on objects by expansion.

Bradley's stellar aberration could be caused by the Earth's movement through the ether. Starlight could be bent in the ether and hit the Earth at an angle, moving the image of the star.

George Stokes thought ether might be rigid for high speeds and fluid at lower, like tar at cold and hot temperatures. Slow objects could penetrate it easily, but not light.

Fresnel proposed the following:

- ether is at rest in free space.
- ether density is different in different substances.
- speed of light in any substance varies inversely as the square root of the ether density.
- light waves are propagated in the free ether in any direction, always with the same velocity with respect to the ether.
- Earth in its motion in space passes freely through the ether without disturbing it.

In general, 19th century physicists thought there was an absolute ether; the dragged ether was denied. The absolute ether was at rest while all cosmic objects moved through it. The motion of the Earth and the motion of an absolute ether are tied together logically. Only if the Earth is at rest in the absolute ether can light travel with equal speed in all directions (isotropically). If the Earth is moving in the absolute ether, the measured speed of light cannot be isotropic. Other possibilities include a fixed Earth and a mobile ether.

Ether as wind

In the heliocentric model, the Earth travels through the ether in its orbit around the sun at a speed of about 30 km/second. A detectable "ether wind," varying with time of day and season, should produce components due to Earth's motion relative to the solar system that are separable from the overall motion of that system. The ether effect on light would be like the wind effect on sound.

Ether and rotation

Recent experiments show that a rotating object has unexplained mechanical anomalies compared to a non-rotating one.

1) Rotating objects falling in ether accelerate faster than 'g', the free fall value for non-rotating objects in a vacuum.
2) Pendula with rotating bob weights deviate from harmonic motion, with lower frequencies than pendula with non-rotating bobs.
3) A precessing gyroscope has inertial mass greater than its gravitational mass.

4) If a gyroscope is forced to precess by applying an external torque, objects placed around the gyroscope cause it to exhibit an increase of inertia.

Besides supporting the ether concept, these experiments can be verified with simple equipment and precision clocks.

Geocentrism and Ether Flexibility

Geocentrism has two options for the transparent ether, either rigid or flexible/plastic, with either one perhaps different from Maxwell's luminiferous ether. A null result from the Michelson-Morley experiment implies a stationary Earth embedded in this rigid ether, the absolute reference frame. However, any non-null result (as in the Dayton Miller and all later interferometer experiments) would imply that the ether is flexible and that the premise of rigidity is incorrect, not that the Earth moves through the ether.

Although cited as having a null result for detecting the ether-Earth motion, careful analysis of the Michelson-Morley experiment by Maurice Allais and others has shown that there was a small but detectable fringe shift measured with the Michelson-Morley interferometers, consistent with the later observations with improved apparatus. The non-null results eliminate the rigid ether as a possibility, so the Earth is the only fixed object, immersed in a universal flexible ether. Hence, Mach's principle can be applied with two options:

1) The ether is fixed and contains a rotating shell of distant matter that provides for the attractive forces needed to explain and synchronize the daily, monthly and yearly celestial motions, as well as explain the local inertial forces near the Earth. All objects move through the ether, except the Earth.
2) The ether is flexible and rotating, providing the forces needed to explain and synchronize the daily, monthly and yearly celestial motions, as well as explain the local inertial forces near the Earth. The rotating ether carries the heavenly objects around the Earth, like boats in a whirlpool.

In view of the Michelson-Morley-type experiments (correctly interpreted) the rigid ether was rejected, so option 1 above is eliminated. Thus, the geocentric model is a rotating invisible ether causing all cosmic objects to perform all the motions observed from Earth. It is this ether type that is meant by the "firmament" of Genesis 1:6-9.

In order to synchronize all cosmic motions, the firmament must be able to transmit changes in location and motion across the universe at least as fast as gravitational changes, which have a lower limit of $2 \times 10^{10}\boldsymbol{c}$, or 1,860,000,000,000,000 miles per second. The speed may be higher.

Ether flux and celestial motions

Etherometry proposes that the rotational and translatory movements of planets, stars and galaxies are the result of spinning motions of ether vortices ordered in a hierarchy. Ether flows and vortices are associated with each star, planet, moon, and the sun, as well as groupings such as clusters and galaxies and the Milky Way. Simply put, ether that flows toward the Earth from deep space imparts downward impulses on the Earth (gravity), while the spin of the Earth's ether vortex causes the inertial forces of centrifugal and Coriolis forces.

Ether motion around the Earth can be deduced from satellite motion, since ethereal rotational motion around an object sustains orbital motion. The translational speed of a satellite is zero at the geostationary distance of 22,000 miles above the Earth. It increases steadily to 18,000 mph at low earth orbit of 70 miles, then decreases sharply at lower altitudes with atmospheric absorption of the ether flow, so that at tropospheric altitudes it will either be moving with or causing the jet stream of up to 200 mph.

The slight west-to-east rotation of the etherosphere at the Earth's surface accounts for the results of Sagnac-type experiments which have shown that the speed of light is slightly faster around the Earth from west to east than from east to west. Moreover, the almost vertical descent of the ether flux at very low altitudes explains the apparent vertical motion of free fall. A free falling object is slightly swept eastward by the ethereal rotation, an effect only noticeable for high falls or with precision instruments.

Modern science presumes the absolute motion of the earth to be the result of two independent motions: (a) the orbital motion around the sun at 30 kilometers per second, (b) and the cosmic motion of the sun and the solar system. Some ether drift measurements indicate motion of the solar system towards the constellation Hercules at a speed of 19 kilometers per second, which is claimed to be only relative motion of the sun with regard to nearby stars.

In order to subtract the Earth's revolution and rotation, the ether-drift effect must be monitored continuously over twenty-four hours and at three or more months of the year. The direction of the orbital motion could not be identified in the monthly curves, which is interpreted as indicating that the orbital component is probably much smaller than the cosmic component. This phenomenon can also be interpreted as indicating the Earth has no orbital motion, but this is not acceptable to the modern cosmologist. Note also, as the Michelson-Morley experiment shows a slight drift, modern cosmology interprets it as a null result; and when the ether drift shows no orbital component, a null result, it is assumed to be non-null!

When plotted against sidereal time, a marked consistency was shown in the readings for the azimuth and magnitude, as though they were related to a common cause. The curves showed conclusively that the observed ether effect is:

- Dependent upon sidereal time.
- Independent of diurnal and seasonal changes of temperature and other terrestrial causes.
- Thus independent of the Earth's alleged rotation and revolution.
- A cosmic phenomenon.

The conclusion stated that there is a positive, systematic ether-drift effect, corresponding to a *constant* relative motion of the Earth and the ether, with an apparent velocity of ten kilometers per second toward the north pole of the ecliptic, having a right ascension of 17 hours and a declination of +65°.

The Stokes ether concept (that the ether is partially entrained by matter moving through it), suggests that the observed velocity of ten kilometers per second might be only a fraction of the absolute velocity; that the actual velocity of the cosmic motion might be two hundred kilometers or more, per second. A first approximation to the velocity of the cosmic component of motion was found to be 200 kilometers per second.

Reduced velocity and displaced azimuth are unexplained. The observed effect is presumed to be of second order in v^2/c^2 and the ether is wholly stagnant and undisturbed by the motion of the Earth through it.

Two unexplained facts of ether-Earth motion remain:

- The fringe displacement has always been less than was expected, indicating a reduced velocity of relative motion, as though the ether through which the interferometer is being carried by the Earth's motion was not absolutely at rest.
- The direction of the cosmic motion should swing back and forth across the north and south line once in each sidereal day because of the rotation of the earth on its axis. This is not observed.

Ether and Relativity

The principle of relativity, which was first formulated by Poincaré, stated that no motion experiment in the universe can detect a point of absolute rest or a preferred direction. Motion and rest are arbitrary choices of definition. The equivalence of all directions is called spatial isotropy.

All reference frames moving relative to each other with constant velocity in a straight line are called inertial reference frames (IRF). The relativity principle is equivalent to saying there is no absolute or preferred inertial reference frame - the laws of motion are equally valid in all.

Calculations of dynamics from the time of Galileo to Einstein used Galilean relativity:

- The velocity of an object is added to the vector velocity difference between the two reference frames – a Galilean transformation.
- The geometry of space is assumed to be Euclidean (flat or not curved). Light travels in straight lines in Euclidean space.
- Time is absolute – the same for all observers.

Galilean relativity was the basis for the laws of Newtonian mechanics but it did not hold for the electromagnetic laws of Maxwell that involved relative motion. Maxwell's laws assumed a luminiferous ether medium for the electro-magnetic radiation, which led to forces dependent on the object's velocity. Thus, combining Maxwell equations and the Galilean transformation allowed an absolute velocity with respect to a preferred frame of reference, the ether. If the symmetric Lorentz transformation of Special Relativity theory is used to change inertial reference frames, the Maxwell equations will still be consistent, since Special Relativity theory has no ether. Special Relativity theory had restored the dynamical equivalence of inertial reference frames for electromagnetism. The null results for ether motion predicted by Special Relativity theory made the ether irrelevant and unnecessary. Now position in space or time was not absolute, but measurements depended only on the observer's speed.

But new problems arose. Time now became relative; observers in relative motion could not agree on their clock readings or on whether events were simultaneous. The human intuition of a universal time had to be abandoned. More seriously, the divine delegation of absolute and universal timekeeping to the motion of the heavenly lights in Day Four of creation was disregarded.

Light measurement differed from that of matter because light travels in the universal ether frame. Sounds in an airplane travel along with the air inside the aircraft and obey the Galilean transformation. But a light beam in the plane would not. It would show some effect of its motion in the universal ether.

What and where was the special coordinate system at rest in the ether? Maxwell had measured electro-magnetic properties of empty space, the ether vacuum, including its resistance of 377 ohms. As a heliocentrist he noted that the "drift" of Earth through the ether should be found in the annual changes of the Earth's motion around the Sun, or the daily variation of rotation (although these changes were 60 times smaller than the yearly changes). This was the motivation for the Michelson-Morley experiment.

Some physicists realized that a number of problems in modern physics would be simplified with the ether concept. Others said the ether makes it difficult to explain modern experiments. In reality, it is only true if the immobile Earth is rejected as a possible cause, a latent premise in experimental interpretation continuing to this very day.

Relativity contains many paradoxes, some based on Einstein's changes in belief. He simultaneously proposed that in Special Relativity there is no ether, yet in General Relativity space is curved by nothing. His position on ether depends on the date. From 1905 to 1915, the age of Special Relativity, there was no need for ether. From 1915 on, in the age of General Relativity, he states: "we may say that according to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether" [NB: but there is no other sense in which to understand the ether]. "According to the general theory of relativity space without ether is unthinkable."

Of course the rejection of relativity is inherent in the acceptance of geocentrism. Some objective physicists are only now realizing from other astronomical evidence that a viable possibility to explain the Michelson-Morley experiment is that the Earth is stationary in the universe. Yes, the dreaded word – geocentrism.

Parallax versus Aberration

The ellipse patterns formed by parallax and aberration are similar and, indeed, are superimposed for nearby stars. But the two stellar effects can be separated, as discussed below in heliocentric terms.

Because of the yearly change in position of the Earth, the direction in which a star is observed changes annually. Unlike aberration, the parallax angle is proportional to the ratio of the diameter of the Earth's orbit to its distance from the star. Bradley observed a different periodic variation in the apparent position of stars, reflecting changes in the velocity rather than in the position of the Earth over the course of a year.

Transit Delay versus Aberration

A light beam on the left shines toward a target, such as Earth. Far to the right are two stars for direction references. For aberration – shown at the bottom – the target Earth is at rest. Light travels from the original position of the source toward the bottom star, reaching the target when the source is opposite the Earth. The aberration angle between the original and final positions of the source is the angle between the two stars.

Transit delay is shown in the top diagram for a stationary source and moving target, a view just as valid as the bottom, by the principle of relativity. To hit the target, the beam must be sent in the direction of the top star when the target lines up with the bottom star. Hunters call this "leading the target." By geometry this leading angle, due to transit delay, is the same as the aberration angle in the bottom diagram.

General covariance

In theoretical physics, general covariance is the invariance of the form of physical laws under arbitrary coordinate transformations. The principle was formulated by Einstein who wanted to extend the Lorentz covariance in Special Relativity to non-inertial frames in General Relativity. All physical theories such as mechanics and electrodynamics must necessarily have a generally covariant formulation.

Physics dabblers will sometimes claim that astronomical observations must be made from a heliocentric point of view. They insist that the use of a geocentric coordinate system will not correctly describe celestial motions, events and alignments, like occultations and eclipses. This point of view – never raised by professional scientists – reveals a failure to recognize the difference between the intrinsic *physical* properties and relationships of a system (which exist independently of any description of it) and the arbitrary *mathematical* coordinate system used to describe the system.

The location of a point on the Earth's surface can be equally described with Cartesian, spherical or elliptical coordinates with the origin at the Earth's center. The system may have a symmetry which matches that of the coordinate system and simplifies the mathematical clutter used in its description (such as the spherical coordinates and the Earth). Nevertheless, any reasonable coordinate system may be used. The weave pattern of a net does not determine the shape of the objects that are put into it.

Occam's Razor

> *Given two equally predictive theories, choose the simpler,* or
> *The simplest answer is usually the correct answer.*

This philosophical advice of Occam was extended to choosing competing physical theories when they could not be separated by reason or experiment. An example often used is General Relativity theory versus all its proposed alternative theories. When expressed in geometrical terms, such as the curving of space as a ball does when placed on a trampoline, or when the dynamics is expressed as one single tensor equation, General Relativity theory is said to be the simplest of theories, and appeal is often made to its mathematical "beauty." Thus, we see that even aesthetic judgments are employed, as opposed to objective ones.

A problem is being ignored in the General Relativity theory example, however. General Relativity's equations expand to 10 non-linear differential equations, which are usually intractable to solve precisely, except for the simplest symmetrical models. The computations are far from beautiful; they are horrendous. Occam's razor can hide complexity in a veneer of deceptive simplicity.

Generally speaking, there are also other issues. A fully open epistemology accepts more sources of truth than does science, such as divine revelation. Whenever revelation – which is the word of the infinitely simple God – overlaps science, it trumps Occam's Razor. Science ignores this freely given gift of truth at the risk of giving an unnatural interpretation of nature.

Occam's razor is often implicit in many interpretations of modern science when an effect/experiment can be explained by more than one cause. No more is this true than in saying the stars are fixed and not rotating, since the opposite view requires that the entire cosmos is focused on Earth, as Scripture describes. To be geocentric is to be theocentric, a challenge of faith that modernists will not accept.

Geocentrism assumed an ether, a preferred frame, and a universal time. Einstein's Special Relativity theory did not. But none of the following eleven independent experiments, which were said to confirm Special Relativity experimentally, can distinguish Relativity from Geocentrism, or from the ether theories of Lorentz or Hatch.

Foucault pendulum

Conceived as an experiment to demonstrate the rotation of the Earth; the motion of the Foucault pendulum is a result of the Coriolis effect. It must be long and free to swing in any vertical plane. The first Foucault pendulum exhibited to the public was in 1851 of the Paris Observatory. It was the first dynamical proof of the rotation in an easy-to-see experiment.

At either North or South Pole, the plane of oscillation of a pendulum remains pointing in the same direction while the Earth rotates underneath it, taking one sidereal day (23 hours 56 minutes) to complete a rotation. Placed at the equator the plane of oscillation rotates with the Earth, so there is no apparent rotation. Other latitudes produce partial rotation. If n = degrees per day and φ = Latitude angle, then

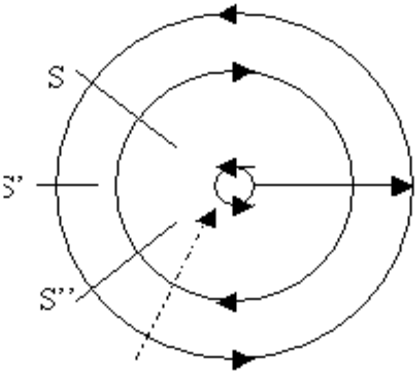
$$n = 360^0 \sin \phi$$

To view the swings for a full day the pendulum should include a periodic source of input energy to overcome air friction and resistance at the point of support.

Sagnac Effect

Experiment design:

The Sagnac interferometer uses ring interferometry to split a beam of light. The two beams travel around the ring in opposite directions and produce an interference fringe pattern when they overlap. The ring interferometer is located on a rotating platform whose interference lines are shifted sideways when compared to the platform when not rotating. The shift sideways is proportional to the angular velocity of the rotating platform. During rotation the points of entry and exit move while the light is propagating so that the beam moving opposite to rotation covers less distance than the co-rotating beam. The pattern found with each angular velocity has a phase-shift corresponding to that angular velocity.



Sagnac apparatus turning clockwise

The counter-clockwise beam in the diagram above opposes the rotation of the platform and returns to the light source when the source is at S'. The second beam, traveling clockwise with the direction of rotation of the equipment, returns to the light source when the source is at S". Seen by an observer on the spinning platform, the light signals return to the same point, but at different times. Points S and S' are points on the fixed laboratory desk, as they would be marked beneath the spinning disc by a stationary observer in the laboratory.

If t_0 is the time when the disc is at rest, *i.e.* the path length divided by the speed of light, then:

$$t_o = 2\pi r/\boldsymbol{c}$$

The time t', as observed aboard the spinning disc, for the counter-rotating beam to complete a circuit, is:

$$t' = 2\pi r/(\boldsymbol{c} + v)$$

where v is the speed of a point on the periphery of the disc with respect to the axis of spinning. The time t'', as observed aboard the spinning disc, for the co-rotating beam to complete a circuit, is:

$$t'' = 2\pi r/(\boldsymbol{c} - v)$$

The time for the counter-rotating light to circle the ring is less than when stationary, so this beam is superluminal. The co-rotating beam takes a longer time to traverse the circle, so its speed is subluminal. In either case the speed of light exhibits anisotropy, contrary to Special Relativity.

For small values of v, t' is t_0 : As v approaches c, t' becomes $t_0/2$, and the speed relative to the observer becomes $2\boldsymbol{c}$. As the speed v approaches c, dt'' becomes infinite, because the light and point S are traveling in the same direction and the time for the light signal to gain one complete circuit on the point S is infinite, while the observer sees the light speed approach zero.

Sagnac found a fringe shift resulting from the difference in travel times and lengths having the size:

$$\Delta \mathrm{n} = 8\boldsymbol{\omega}\mathbf{r}^2/c\lambda$$

Alternatively, in terms of the time difference and the area of the loop **A,**

$$\Delta t = 4A\omega/c^2$$

At only two revolutions per second, Sagnac found that absolute rotation could be measured.

In a ring laser, the light is generated and sustained by including laser excitation in the path of the light. When a ring laser is rotating, the different effective paths of the two opposite-moving laser beams generate two frequencies with equal number of cycles. A standing wave is created in the ring laser which is always stationary with respect to the local inertial frame of reference – the laboratory – whether the laser is rotating or not. If the ring is rotated, the nodes of the standing waves can be recorded as they pass by an observation point. Interference of the two laser frequencies forms a beat frequency, the difference between the two counter propagating modes. The beat frequency period varies linearly with the angular velocity of the ring laser with respect to the local inertial frame of reference.

$$\Delta f = 4A\omega/\lambda P$$

ω is the angular rotation of the Earth.
λ is the wavelength of the light.
P is the perimeter of the ring laser.

The speed of the passing nodes in the ring laser test depends upon the shape of the ring, not the area. In all cases – circle, square, triangle, etc., the velocity of the passing nodes is directly proportional to the rotation rate.

The development of the ring laser has led to a far more accurate method of measuring the Sagnac effect with no moving mechanical parts. Sagnac's interferometer accuracy of 10^{-2} has been improved by 18 orders of magnitude to 10^{-20} by Bilger with a ring laser.

Applications

Synchronizing clocks all over the globe using radio signals must take the rotation of Earth into account. In relaying timing signals with ground stations or satellites completely around the world, the time-keeping must synchronize. Without rotation, the time delay between relay points is determined by the separation distance alone. On the rotating Earth, the receivers move during the signal transit time, affecting the total time delay.

The need to include Earth's rotation for synchronization is called the Sagnac effect.

The Optical Laser Gyroscope uses the temporal difference between forward and reverse beams to measure rotation, a phenomenon that contradicts Special Relativity. Einstein always considered the Optical Gyroscope to be theoretically impossible.

Commentators

Herbert Ives states:

> [if the observer's] apparatus rotates with respect to the stars he will observe a Sagnac effect, if it does not, then no matter how great a relative rotation it exhibits with respect to its material surroundings, there will be no effect.

The key condition is that the equipment rotates relative to the stars. Since Ives doesn't specify that the stars are "fixed," his principle is consistent with Mach. The Sagnac effect is present whether we view the stars as stationary and the apparatus as rotating, or whether we view the apparatus as stationary and the stars as rotating. As it stands, Ives showed that Special Relativity theory cannot explain the Sagnac result. The same etherless Special Relativity theory that explained why the Michelson-Morley experiment detected no terrestrial motion around the Sun would also predict that the Earth should not seem to rotate, there being no ether to rotate in.

Michelson wrote:

> …this result [Sagnac] may be considered as an additional evidence in favor of relativity - or equally as evidence of a stationary ether.

That is, an immobile Earth in a Machian universe.

Note worthy is the fact that no reference by Einstein to the Sagnac tests is known, even though it was done eight years after Special Relativity was published, in addition to the fact that the results bear greatly on the validity of Special Relativity theory. Silberstein remarked,

> As a matter of fact, Einstein himself never entered into the details of this important problem of rotation….In fine, the optical circuit experiment may easily become crucial and fatal for Einstein's theory.

Turner (1979) commented that neither the Sagnac tests nor the Michelson/Gale tests were ever mentioned by Einstein. Post (1967) saw that there was a conflict in Special Relativity theory between the treatment of straight-line motion versus the rotating disc:

> To be consistent with the principle of relativity one has to demand that the Sagnac interferometer and the ring laser cannot lead to a fringe shift or a beat frequency if the equipment is in uniform translational motion. The special theory of relativity does not apply to Sagnac because Lorentz transformations are restricted to pure translation. While this saved the situation from formal contradictions, it did leave a disturbing conceptual discontinuity. Why did Galilean kinematics suffice for rotational motion and then fail for pure translation?

Why was Special Relativity theory only applicable to uniform linear relative motion, while Newtonian theory could only explain rotational motion? The scope of each theory was exclusive of the other; neither could describe all types of motion.

Claims and Responses

Claim #1: The Sagnac instrument has no connection with its environment; light speed is independent of the device's surroundings.

Response: The device is a closed reference frame, which however detects its own turning motion, indicating a connection with the environment. This contradiction means that the implication of postulate 2 of Special Relativity theory is incorrect - space is not empty.

Claim #2: Ballistic theories such as Ritz's were tested directly, as the light paths around the ring had different lengths to travel. The detector and mirrors would be moving toward/away from the light. In a ballistic theory, a light photon has particle properties, so its speed depends on the motion of the source, $\boldsymbol{c} \pm \mathrm{v}$. Like a bullet fired from a moving gun, the speed of light is combined with the motion of the source, as in Galilean relativity. Ballistic theories predict no shift, that is, the net velocity between the light source and detector was zero, since they were both fixed on the rotating platform. However in the Sagnac experiment a fringe shift effect *was* seen, eliminating any simple ballistic theory.

Response: The reasoning is correct but ignores the extinction effect of the stationary air through which the light passes. Application of ballistic theory to the absorption of the photons by air molecules at rest (on average) leads to an emission of a new photon at $c + 0 = c$. Although the light is emitted from the mirrors at $c \pm v$, the beam speed is converted to the free space value of c when passing through air. Its measurement would then agree macroscopically with Special Relativity theory – the observed speed would always be c. An obvious test of the extinction hypothesis is to employ a vacuum Sagnac interferometer or perform the experiment in space.

Claim #3: In an inertial frame of reference, mirror motion during flight causes the opposite moving waves to be reflected at different places, leading to a net path difference.

Response: Replace all the individual mirrors by one cylindrical mirror. This is equivalent to considering an N-sided polygon in the limit as N ➔ infinity, so the light path is everywhere tangent to the cylindrical mirror. There is now no need for the mirror to rotate at all – opposite moving waves will not be reflected at different positions in space.

Claim #4: The ether cannot rotate around the Earth.

Response: See response above.

Claim #5: But the rotating ring is accelerated circular motion, while c is constant only in inertial frames of reference.

Response: Herbert Ives showed by analysis in 1938 that “the Sagnac experiment in its essentials involves no consideration of rotation,” meaning that it is not the rotation that produces the effect. The measured Sagnac effect would be unchanged if the Sagnac interferometer were moved along a chord of a hexagon-shaped light path rather than rotating the entire structure. The effect could thus be produced without rotation or acceleration, confirming that there are linear versions of the Sagnac effect. Operational Global Positioning System technology uses the Sagnac effect to synchronize clocks that may be in any arbitrary state of motion.

Claim #6: The Sagnac effect is independent of the choice of reference frame. An observer co-moving with the ring will find the speed of light tangent to the ring is: $c \pm r\,\omega$ for light moving against or with the rotation of the ring. Only the case of $\boldsymbol{\omega} = 0$ is inertial. For $\boldsymbol{\omega} = 0$ this frame of reference is non-inertial, where Special Relativity theory does not apply, so the speed of light in this case can vary from ***c***.

Response: This shows that rotation is not excluded in Special Relativity, and exposes the confusion of supporters.

Claim #7: Special Relativity theory does not apply to non-inertial systems, like the Sagnac device.

Response: The non-inertial character of the rotating platform is of no significance since the light travels through free space between the mirrors. The light beam is observed to move rectilinearly, not in a curved path.

Claim #8: Sagnac effect causes a Doppler shift, as predicted by Special Relativity.

Response: There is no Sagnac Doppler shift. If the observer is in the laboratory, there would be a very small second order Doppler effect when observing the moving apparatus, but this is insignificant in affecting the result. There was no Doppler effect at all in the original Sagnac test, because the observations were made aboard the spinning disc, and the observation point was at a constant distance from the point of interference.

Claim #9: Post Sagnac, Special Relativity theorists proposed that the observer being in a rotating frame (non-inertial) made Special Relativity inapplicable.

Response: At radius r the acceleration is $a = v^2/r$ and the difference in observed light speeds is $2v$. By doubling the radius the acceleration is $a = v^2/(2r)$ and the difference in observed light speeds is still $2v$. The speed difference is completely independent of the acceleration. Even when $a = 0$, the frame thus being inertial, the difference is still 2v. Sagnac's original assessment was correct – the speed of light is dependent on the observer.

Claim #10: This analysis is perfectly valid in both the classical and the relativistic contexts with respect to the axis-centered inertial frame.

Response: The classical result is:

$$\Delta t = 4A\omega/c^2 = 4\pi r v/c^2$$

and Special Relativity theory is:

$$\Delta t = 4A\omega/(c^2 - v^2) = 4\pi r v/(c^2 - v^2)$$

At the non-relativistic speeds used by Sagnac, the second order difference between the two would not be detectable. But there is a theoretical difference.

Claim #11: A clock attached to the perimeter of the ring would record a lesser time, by the factor $\gamma = (1-(v/c)^2)^{1/2}$, so the Sagnac delay would be $[4A\omega/c^2]/(1-(v/c)^2)^{1/2}$. However, the characteristic frequency of a given light source co-moving with this clock would be greater than the axis-centered frame by precisely the same factor, so the actual phase difference of the beams arriving at the receiver is invariant.

Response: One relativist says the perimeter is non-inertial and Special Relativity theory can't be applied. Another relativist says Special Relativity theory and Lorentz transformations can be applied and produce the observed effect. The inherent confusion of Special Relativity theory's principles and application surfaces again.

Claim #12: The Sagnac effect rules out the ballistic theory of light propagation (as advocated by Ritz in 1909), according to which the speed of light is the vector sum of the velocity of the source plus/minus a vector of magnitude $\boldsymbol{c}$.

Response: In ballistic theory/Galilean relativity, the light traveling against the rotation is detected as:

$$(1)\ c_1 = c + v$$

where v is the velocity of the rim. The light traveling with the rotation is detected as:

$$(2)\ c_2 = c - v$$

In Special Relativity theory, light speed is independent of the observer, so the trivial results of the Sagnac experiment should be:

$$(3)\ c_1 = c_2 = c$$

The Sagnac experiment confirmed that (1) and (2) were, in fact, correct, supporting the classical concepts of an absolute rest frame, as Sagnac claimed.

Claim #13: Both the Michelson-Morley experiment and Sagnac are consistent with Special Relativity, since Sagnac found that, in ambient space, the light is propagated with a constant speed, independent of the overall movement of the source of light and optical system.

Response: No. Sagnac found that the light speed observed was affected by the motion of the disc.

Claim #14: The Sagnac effect is a purely “classical” effect. Relativistic effects apply equally in both directions, hence, the higher-order corrections of special relativity cancel out of the phase difference.

Response: This Special Relativity theory commentator says the Classical and Special Relativity theory formula for the time delta are the same, while others say Special Relativity theory has a $1/(c^2 - v^2)$ correction to the classical value. How can these subjective interpretations be considered as objective evidence of a well-understood theory of nature?

Claim #15: The Sagnac effect is based on isotropic light speed with respect to one particular system of inertial coordinates, the axial frame. All other inertial coordinate systems, like the observer on the ring, are related to this one by Lorentz transformations, which are defined as the transformations that preserve light speed. Hence no description of a Sagnac device in terms of any system of inertial coordinates can possibly entail non-isotropic light speed, nor can any such description yield physically observable results different from these.

Response: If the reference frames are reversed and the disc circumference frame is the observer’s frame, and the Lorentz transformations give the corresponding distance and time measurements for the axial frame, then why don’t the predictions for this model match the Sagnac measurements? The reason is that the axial frame in the laboratory is the preferred Geocentrism frame – the circular motion is not.

Claim #16: The pulses of light are never (let alone always) at the same point in the loop at the same time during their respective trips around the loop in opposite directions.

Response: The pulses traveling in opposite directions must overlap or cross once before completing one circuit.

Claim #17: At any given instant the point of the loop where one pulse is located is necessarily accelerating with respect to the instantaneous inertial rest frame of the point on the loop where the other pulse is located (and vice versa). Only one inertial reference frame can exist on the loop; all the rest are non-inertial.

Response: Circular path implies non-inertial; straight line implies inertial? Circular motion at uniform speed as an inertial reference frame has been questioned when centrifugal force and acceleration are considered. For uniform circular motion there is no component of acceleration parallel to the path in this case; otherwise the speed would change. Tests with various mirrors forming different polygons on a rotating table confirm that the light traveling in a straight line on a polygonal section does not travel at the speed *c* relative to the moving disc. Even Einstein said there is no reason to believe that light traveling in a series of polygonal lines will behave differently from light traveling in one straight line. Many supporters claim that Special Relativity theory cannot be applied to motion in a circle, or on a closed circuit, or to anything but single straight line motion. But Einstein applied Special Relativity theory to exactly those situations in the 1905 basic paper. Einstein (1916) later changed his mind when he launched his General Relativity:

> The word 'special' is meant to intimate that the principle is restricted to the case when K' has a motion of uniform translation relatively to K, but that the equivalence of K' to K does not extend to the case of non-uniform motion of K' relatively to K.

Note well, this is just one example of Einstein's many vacillations that allow relativity defenders to selectively cite Einstein's writings whenever there is a seemingly insurmountable difficulty with Special Relativity.

Claim #18: The two pulses do *not* traverse similar paths from emission to detector (assuming the device is absolutely rotating). The co-rotating beam is traveling slightly farther than the counter-rotating beam *in the inertial sense*, because the detector is moving away from the former and toward the latter while they are in transit.

Response: Introduction of undefined terms is a common ploy in Special Relativity theory explanations. What does "in the inertial sense" mean? If one beam travels farther than the other this means it travels faster. Why is the motion of the detector a problem?

Claim #19: The second-order effects of Special Relativity theory have been confirmed empirically by the Michelson-Morley experiment. Considering the Earth as a particle on a large Sagnac device as it orbits around the Sun, the ether drift experiments demonstrate these second-order effects, confirming that the speed of light is indeed invariant with respect to relatively moving systems of inertial coordinates.

Response: Second order effects were not originally thought to be detected by the Michelson-Morley experiment – the null result. This was Einstein's rationale for proposing Special Relativity theory with an etherless medium for light. Later experiments by Miller and re-analysis of the Michelson-Morley experiment's raw data show a drift velocity of ~ 8 km/s was present, contrary to the postulates of Special Relativity theory. It is a contradiction to say that the ether drift shows the validity of Special Relativity when, in fact, it was based on an etherless space.

Claim #20: In the Sagnac experiment the path around the circumference should be unwrapped into a straight-line path and the Lorentz transformation from the stationary to moving frame applied to this unwrapped moving circumference. This gives the correct fringe shift.

Response: Yes, but it directly contradicts the Goldstein and Misner, Thorne and Wheeler theory prescription for handling accelerations within Special Relativity theory as a succession of infinitesimal Lorentz transforms

Claim #21: No matter how large the disc, it does not approximate a straight line, because there is still some rotation involved. So no part of the Earth qualifies strictly as an inertial frame of reference.

Response: The center of the Earth, presumed to be moving around the Sun but not rotating (the ECI frame – Earth Centered Inertial) is taken as a suitable and perfectly acceptable inertial frame for Global Positioning System measurements, with no operational problems noted. The Hefele & Keating (1972) experiment also claimed that nearby space, co-moving with the Earth, was acceptable as a suitable inertial frame. This is equivalent to the Geocentric frame as far as Earth's movement is concerned. The non-rotating Earth-centered frame is acceptable to Special Relativity theory adherents as a satisfactory inertial frame of reference. But the surface of the earth (the laboratory) is not considered as an inertial frame for the Bilger laser test, even though there is no relative motion between observer and the ring laser apparatus, and the center of the Earth rotates, during the Hefele & Keating case, by an angle greater by 10,000,000,000,000 than the Bilger test. In the Bilger test there is a rotation that is 5×10^6 smaller than the Global Positioning System case. In the original Sagnac test, the Earth would have turned 2.8×10^{-13} orbital degrees during the test. During a Global Positioning System test around the equator, the Earth would have turned by 10,000,000 times the amount it turned during a Sagnac test. Asserting that Special Relativity theory does not apply to rotation, while simultaneously using it daily in operations such as the Global Positioning System that has seven orders of magnitude greater rotation than the Sagnac experiment, is illogical, and a very narrow and ‘just so’ manipulation of the meaning of an inertial frame.

The results are the same for spinning discs of any radius; with a disc of arbitrarily large radius, the path shape approximates a straight line. The effect thus applies to all objects moving at constant speed. If the disc is so large that we cannot distinguish, within experimental error, any deviation from a straight line, then the result is applicable to straight-line motion. The deviation from a straight line on a distance such as used in the Michelson/Gale (600m) tests will not be detectable. As the Earth is said to perform all sorts of movements with respect to Sun, galaxy and stars, then technically speaking, Special Relativity theory cannot be applied anywhere on Earth.

Claim #22: The Sagnac device centers around one particular system of inertial coordinates (center of a circle), and all other inertial coordinate systems are related to it by Lorentz transformations.

Response: What happens to the measuring clock when the radius of the circle becomes very large and the clock’s velocity small – a limit process? The Sagnac effect still applies and the clock’s motion becomes more linear. In this limit process, it is reasonable to treat the moving clock as an inertial reference frame in its own right. Contrary to the constancy of ***c*** in Special Relativity, the Sagnac effect requires that the speed of light must be either $c + v$ or $c - v$, and not ***c***! This limit process shows that Special Relativity theory contradicts itself, as the real measurements are made in the moving clock frame and not at the center of the disc. If only an inertial frame of reference at the circle’s center can explain the Sagnac effect, then Special Relativity theory is really Special Absolutivity Theory.

Summary

1. Sagnac modified the Michelson-Morley apparatus to look for the rotation of the Earth within the ether.
2. The light beams are in synchronism when released.
3. The light beams are not in synchronism when they have completed one turn of the apparatus.
4. Any observer on the rotating apparatus, or stationary in the laboratory, will observe identical fringe shifts.
5. The light behaves as if traveling at constant speed relative to the laboratory Geocentric system, oblivious to the spinning table around it. The light does not travel at a constant speed ***c*** relative to the observer aboard the spinning table. Moving in the same direction as rotation, it goes slower than ***c***; in the other direction it goes faster than ***c***.
6. Time and distance aboard a spinning disc are identical with a stationary laboratory. They are also identical aboard an object that is moving at uniform velocity in a straight line.
7. The Sagnac effect applies to uniform straight-line motion, just as it does to rotational motion.
8. The Sagnac effect is the result of a non-isotropic speed of light that arises any time an observer moves with respect to the Geocentric frame.
9. The Sagnac results are compatible with a constant velocity of light moving through ether in an absolute frame of reference.
10. The Sagnac equation applies for any shape of circuit.
11. The Sagnac experiment was sufficient proof of spatial anisotropy ($c \neq$ constant) and indirect evidence for the classical Galilean law of velocity addition.
12. Ring laser experiments confirm that light, in small-scale experiments, travels relative to the laboratory – the Geocentric Earth frame.

13. Since the rotation speeds are not relativistic, both classical physics and special relativity can be applied.

14. Special Relativity theory clearly disagrees with the Sagnac results. Sagnac effects are dependent on the velocity relative to the Geocentric frame rather than on the velocity of the receiver relative to the source, as Special Relativity theory predicted.

15. The Sagnac effect is the electromagnetic counterpart of mechanical rotation. A free gyroscope can be used to measure the rotation of the gimbal mounting; a Sagnac interferometer measures its angular velocity with respect to the local inertial (Geocentric) frame.

16. By Mach's principle the Sagnac effect cannot distinguish between whether the Earth actually rotates and the ether is at rest, or the Earth is at rest and the ether whirls around it.

17. The photographic record could be taken from the spinning disc or from the fixed laboratory - the result is the same.

18. Sagnac found a velocity of 13 m/sec caused one fringe shift (one cycle difference in the beam), a speed far below consideration of Special Relativity theory effects.

19. Wang *et al.,* (2003) showed that the Sagnac result is also obtained on a two way linear path, by reversing a light beam sent out on a straight line on a moving platform and measuring the difference in return time.

20. The second order effect forecasted by Special Relativity, for the time dilation aboard a moving object, is far smaller than the first order effect observed in the Sagnac test.

21. The original Sagnac experimental results were not specifically due to rotation. Wang has constructed a Fiber Optic Conveyer experiment that directly verifies that linear motion has the same effect as circular motion, consistent with Geocentric theory.

22. Variations include:
    a. putting the apparatus in a vacuum,

b. using some other medium than air,
c. rotating the medium while the mirrors are stationary in the Earth frame of reference,
d. keeping light source and detector fixed in the Earth frame, separate from the rotating platform,
e. moving the rotation center away from the geometric center,
f. changing the shape of the circuit but not the area.

None of these modifications influenced the result.

Geocentric Interpretation

The Sagnac effect shows that the light is not affected by the movement of the source, and that light travels relative to the laboratory, because assuming that the light travels relative to the laboratory gives the correct result in all cases. The laboratory frame is the Geocentric frame. In the case of circular trajectories, Sagnac has shown how the velocity of light varies linearly with the observer's velocity. The absolute velocity of light, *c*, with respect to a fixed earth frame (Geocentrism) is an experimental fact. The results are compatible with all known experiments.

There is an inconsistency, however, in the relativistic *interpretation* of what's really happening locally in the Sagnac device. In Special Relativity theory, each point on the perimeter of a rotating circular Sagnac device is always instantaneously at rest in *some* inertial coordinate system, and according to Special Relativity the speed of light is precisely ***c*** in all directions with respect to any inertial system of coordinates. Thus the speed of light must be isotropic at every point around the entire circumference of the loop, and hence the light pulses must take an equal amount of time to traverse the loop in either direction.

The beams of light are traveling the same inertial paths through space as they proceed from the source to the detector, whether the mirror platform rotates or not. Yet their time difference is only zero if the platform is not rotating with respect to the Earth – the Geocentric frame. The inanimate unintelligent Sagnac device knows that it is rotating with respect to a special/preferred/absolute frame of reference – so, why don't the scientists observing the apparatus also know it?

The dependence of the Sagnac effect on the enclosed **S**urface relative to the rotation axis recalls the familiar classical electric and magnetic fluxes which are key concepts in Maxwell's laws, $\boldsymbol{E}\cdot\boldsymbol{S}$ and $\boldsymbol{B}\cdot\boldsymbol{S}$. The question now is, what field is flowing through the Sagnac ring area to produce the fringe shift anisotropy? Sagnac results are an uncontested fact, but the interpretation is far from that. Special Relativity advocates use an implicit assumption of a universal frame of reference for convenience, but boldly deny its existence when questioned if its use is arbitrary or mandatory.

What is the logical approach? When the Sagnac turntable is at rest, all agree there is no fringe shift. If *c* is, indeed, constant in all inertial reference frames in Special Relativity, will spinning the whole room, including the light source and detector, around the stationary platform of mirrors change the arrival time of the two beams? Special Relativity theory says: “of course not!” The Sagnac effect says: “yes – if the room was stationary in the lab/Geocentric frame!”

Sagnac developed his equation based on the assumption that an ether existed. Kelly showed that the same result is found using the stationary laboratory. Yet he (and others, like Cahill and Hatch) fail to put the two ideas together into the logical conclusion that, if the universal frame provided by the ether is also supplied by the laboratory (Geocentric) frame, then the universal absolute reference frame is the stationary Earth!

Although there is no universal frame of reference and more than two frames of reference are never theoretically needed, the Sagnac explanation for Special Relativity theory must add a third frame of reference called “proper time.” In the third frame, the light beam is traveling a different distance, which is then asserted as the reason the two beams are unsynchronized. But why is there a proper time? Why is not the frame of the emitter or source, or the axis of rotation, capable of giving the “proper” results? The choice isn’t convenient or expedient – it’s mandatory, and thus absolute! In actuality, most attempts to explain the Sagnac effect consistent with Special Relativity implicitly assume ether’s existence, under the guise of a third reference frame or a “proper time.”

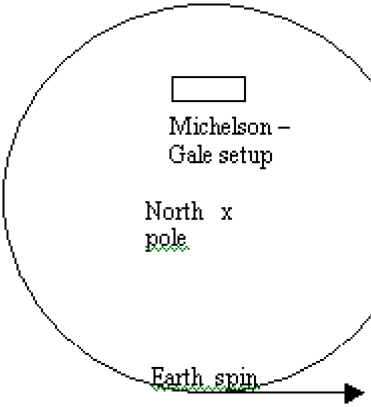
The Michelson-Morley experimental apparatus designed to detect the relative motion of the Earth and the luminiferous ether has a fundamental flaw that is exposed by the Sagnac effect: the effect of the relative motion does not depend on the length of the optical path, but on the surface enclosed by the optical path, as shown originally by Michelson in 1904 and confirmed by Sagnac in 1913. If the speed of light is a constant for the observer, then, for the observer on the rotating ring, light should take the same time to travel each way and no effect should occur. Sagnac proved that there *is* ether that the light has to pass through, a formidable challenge to Einstein’s theory of Relativity that claims there is no need for ether. It is for this reason that the Sagnac experiment is virtually ignored by modern scientists.

Michelson-Gale Experiment

Michelson and Gale showed in 1925 that the Sagnac effect can also be seen if the apparatus is fixed to the Earth, making the Sagnac platform the same dynamically as the Earth itself – the same reference frame of the Michelson-Morley experiment. Unlike the Michelson-Morley experiment, the Michelson-Gale experiment did not produce null results. The observed displacement was closely related to the rotational velocity of the Earth, lending support to ether theories.

Like the Michelson-Morley experiment, Michelson-Gale compared the light from a single source after traveling in two directions over two rectangles of different size. Light in the rectangles reflected off corner mirrors and returned to the starting position. The light exiting the two rectangles was compared on a screen. Michelson-Gale utilized a large rectangular array of pipes and mirrors, with the East-West legs about 7 football fields long and the North-South legs about 4 fields long. This large area would make the equipment sensitive to the Earth's rotation. A calibration loop had the same North-South length, but a very short length in the East-West direction of the Earth's rotation, for comparison of the fringe shifts in the full-size loop.

If ether is dragged rotationally by the Earth, light traveling in the longer rectangle will encounter a different amount of drift than in the smaller one, because the two legs of the longer rectangle are spinning at different speeds, the northern leg moving slower than the southern one.



Numerical results can be easily derived by realizing that the equipment is equivalent to the Sagnac experiment, except that the mirror platform is fixed on the Earth, so any rotation detected must be due to the Earth itself. The Sagnac time difference is:

$$\Delta t = 4A\omega/c^2$$

in which the rotation axis is always orthogonal to the mirror platform. As the diagram above shows, the Earth's axis of rotation projects onto the loop of the Michelson-Gale apparatus on the Earth's surface at an angle corresponding to the latitude ϕ. At the equator ϕ is zero and the polar axis is parallel to the Michelson-Gale loop area; there is no delta *t* for this location. At either pole ϕ is $\pm 90^\circ$, and the polar axis is perpendicular to the Michelson-Gale surface. This is the maximum value possible, corresponding to the Sagnac value above. At any intermediate latitude the time difference for Michelson-Gale is given by:

$$\Delta t = 4A\omega\,(\sin\phi)/c^2$$

For a rigorous but equivalent derivation of the Michelson-Gale equation, see the corresponding footnote.[293] This exact result is obtained without explicitly invoking an ether, Lorentz transformations or General Relativity.

Claims and Responses

Claim #1: The Michelson-Gale experiment shows that the Earth is rotating with respect to the heavens.

Response:

1. It is only the relative rotation between Earth and cosmos that was detected, hence the Machian universe cannot be excluded.
2. The precision of the experiment could not distinguish a 24-hour solar period (a local effect) from a period 4 minutes shorter (the universal sidereal period).
3. Just as the free mechanical motion of the Foucault pendulum defined a plane of motion relative to the rotating heavens, the free motion of the Michelson-Gale light ring defined a plane of radiation relative to the same heavens.

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[293] http://www.commonsensescience.org/pdf/pdf/light-speed_and_aether.pdf

Claim #2: The experiment was expected to generate a positive result both for entrained ether as well as that due to relativistic effects. The Michelson-Gale result appeared to be a null result, or at least a rather inconclusive one. The average of 269 measurements showed .26 fringes, which is minimal evidence of rotation and the ether, but also not statistically significant.

Response: Detailed analysis of the data clearly shows the periodic nature of the 24-hour effect. Of course, averaging the wave greatly reduces its magnitude. The largest fringe was 0.55. Modern equipment, such as the optical gyroscope, has erased any doubt of its reality!

Claim #3: It was not considered a failure of Einstein's relativity because the rotating Earth is not considered to be an inertial frame of reference. Special relativity does not apply here. General relativity must be used since Special Relativity theory considers this a Sagnac-type of experiment in a rotating (non-inertial) frame of reference.

Response: See the Sagnac experiment responses to the same claim made then, that the environment is non-inertial.

Summary

Michelson-Gale detected the ether moving past the Earth's surface at 2% of the rotation speed. While the Michelson-Morley experiment detected no heliocentric movement, the Michelson-Gale experiment measured either the effect of the Earth's rotation or the ether's rotation around the Earth. As with the Sagnac test, Michelson-Gale data show clearly that ***c*** is not a universal constant, contradicting Special Relativity.

The assumption of ether needed ever more corrections to explain new and improved experiments. Finally, Einstein eliminated the ether. The derivation above demonstrates that no corrections are necessary. By means of bad assumptions, faulty interpretations and frequent back-tracking, Einstein formulated the Special Theory of Relativity. Creative interpretation of Special Relativity is needed by individuals to apply it to the experiments covered so far, an instability that can be traced to its erroneous underlying principles. Proponents insist on patching up the application of Special Relativity to reality, trying to rescue a doomed theory, rather than examine if the foundation is at fault.

The Hefele-Keating Experiment

Hefele-Keating press release:

> During October 1971, four cesium atomic beam clocks were flown on commercial jet flights around the world twice, once eastward and once westward, to test Einstein's theory of relativity. From the actual flight paths, theory predicted that the flying clocks, compared with reference clocks at the U.S. Naval Observatory, should have lost 40 ± 23 nanoseconds eastbound and gained 275 ± 21 nanoseconds westbound.... Relative to the atomic time scale of the U.S. Naval Observatory, the flying clocks lost 59 ± 10 nanoseconds eastbound and gained 273 ± 7 nanosecond westbound…These results provide an unambiguous empirical resolution of the famous clock "paradox" with macroscopic clocks.

According to Special Relativity, the aircraft moving eastward with the Earth rotation would have more delay than the one moving westward. Compared to the universe, the eastbound aircraft has a slight boost in speed over the westbound, with the observatory clock halfway between the two. For flights eastbound, v has a positive sign (same direction as Earth rotation) so the net shift in time will be negative (aging more slowly). Westbound, the time shift is positive (aging faster).

Gravity Time Shifts

For small changes in the gravitational potential, the reading of the surface clock, T_E, compared to the central standard clock at the Earth's center, T_0, is approximately:

$$T_E \sim T_0(1 + gR/c^2) \qquad (1)$$

Referred to the same clock, the airplane clock reading at height h is:

$$T = T_0[1 + g(R + h)/c^2]$$

The difference between the two is:

$$T - T_E = T_0(gh/c^2) \qquad (2)$$

From (1):

$$T_0 = T_E(1+gR/c^2)^{-1} \sim T_E(1- gR/c^2)$$

To order $1/c^2$ (2) becomes:

$$T - T_E = T_0(gh/c^2) \sim T_E(1 - gR/c^2)gh/c^2$$

$$= T_E(1 - gR/c^2)gh/c^2 \sim T_E(gh/c^2)$$

comparing a surface clock(T_E) and the plane above the surface (T).

These predict a time difference of 144 nanoseconds eastbound around the world for a flight time of 41.2 hours at 8900 meters. The time shift is positive (aging faster) for both east and westbound flights. The predicted value of 179 ns for the westbound flight of 48.6 hours uses h = 9400 meters.

Velocity Time Shifts

The time dilation expression

$$T = T_0/(1 - v^2/c^2)^{1/2}$$

T_0 is the rest frame "proper time" for the event. For small velocities, T is about:

$$T = T_0(1 + v^2/2c^2)$$

The problem with measuring the difference between surface and aircraft clocks is that neither location is exactly an inertial frame. If we take the center of the earth as an approximation to an inertial frame, (the ECI or Geocentric frame), then a "proper time" can be measured at the center as if the master clock were there. Time measured by a surface clock would be larger than the proper time:

$$T_S = T_0 [1 + R^2\omega^2/2c^2] \qquad (3)$$

R is the radius of Earth and ω is its angular rotation. The airplane clock would be approximately:

$$T_A = T_0 [1 + (R\omega + v)^2/2c^2]$$

since h << R. The difference in the times compared to the hypothetical master clock would then be:

$$T_A - Ts = T_0[(2R\omega v + v^2)/2c^2]$$

In the experiment the master clock is on the moving surface, not at the center, where it would be immeasurable. Solving for T_0 in (3) gives:

$$T_0 = Ts\,[1 + R^2\omega^2/2c^2]^{-1} \sim Ts\,[1 - R^2\omega^2/2c^2]$$

and then substituting for Ts in the last equation:

$$T_A - Ts = Ts\,[1 - R^2\omega^2/2c^2][(2R\omega v + v^2)/2c^2]$$

Ignoring the fourth order term in ***c*** compared to the second order, and including the lag of the plane clock behind the surface clock, the change of the airplane clock with respect to the ground clock is:

$$T_A - Ts = -T_S[(2R\omega v + v^2)/2c^2]$$

The absolute reference at the center has disappeared, to be replaced by the approximate surface time. Now the times are accessible to measurement. Both gravitational and kinematic time dilation are significant and of comparable magnitude. Hefele-Keating predictions distinguish between the gravitational and kinematic effects, but the aircraft flight data always includes both effects together.

Summary of predictions and results:

Predicted	Time Δ in ns	
	Eastbound	Westbound
Gravitational	144 ± 14	179 ± 18
Kinematic	-184 ± 18	96 ± 10
Net Effect	-40 ± 23	275 ± 21
Observed	-59 ± 10	273 ± 21

Hefele and Keating are credited with confirming time dilation with an accuracy of about 10%, as well as answering the twin paradox. They are said to have proved that a plane's speed and direction affect the real time changes recorded by atomic clocks on the planes. There is no reason given why Special Relativity predictions only work if the Earth's axis is chosen as its reference frame, or why a real permanent change occurs in the final readings of the atomic clocks after returning to rest on the ground.

Technical problems

An engineer, A.G. Kelly, obtained the original 1971 test report from the United States Naval Observatory and discovered that:

- The original data actually did not support the result computed in the 1972 paper.
- The Cesium clocks that were carried varied in time so badly that some of them could vary more than the total supposed results during the time of the test.
- The most stable of the four clocks indicated zero time accumulation/dilation.
- The final published outcome had to be averaged in an extremely convoluted and biased way.
- Even the inventor of the atomic clock, Louis Essen, concluded that the alterations in drift-rates of the clocks made the results useless.
- The accuracy of the clocks would need to be two orders of magnitude better to give confidence in the results.
- The actual test data were not published originally.
- The corrections made by Hefele-Keating to the raw data are unjustified.
- Hefele-Keating took the average of the drift rates before and after a flight to be the drift rate during the flight.

- The Cesium clocks drifted from 2 to 9 ns. per hour, and the rates could vary by as much as 4ns. A maximum possible error of 300 ns in the test overwhelms an expected result of only 40 ns. Note: Atomic clock systems (including Global Positioning System) are now accurate to about 10 ns, at best.
- The clocks were not of equal stability; averaging could not make the test more reliable.
- Under the revised USNO guidelines issued the following year, the Hefele-Keating results would have been rejected as unreliable.
- Although the data graphs are never linear, Hefele-Keating assume that the curves are linear for the moving planes. Non-linear when measured, they magically become linear when not directly measured!
- Time changes of individual clocks are both + and - for both flights.
- Only the linear analysis of the average clock times agrees with Special Relativity.
- Objective analysis shows no significant difference in the moving clock behavior.

Domina Spencer also analyzed the raw data from Hefele-Keating experiment and found rampant technical errors: [294]

- No two “real” cesium beam clocks keep precisely the same time.
- There are systematic rate (or frequency) differences as large as 1 second per day.
- The smooth curves interpolated during flight appear to be entirely unaffected by the plane’s motion.
- Data have been subjected to a major smoothing process.
- No data was taken during the east or west bound trips, only before and after.

She interpreted the data to show:

- An entirely different interpretation of the experimental data from Hefele-Keating, which supports the Geocentric paradigm.
- The validity of Universal Time Postulate III: In a coordinate system that is not moving with respect to the source and which is not in rotation, the velocity of light in free space is a constant *c*.

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[294] http://www.physical-congress.spb.ru/english/ spenser1/spencer1.asp

The Geocentric frame does not move with respect to the surface nor does it rotate.

- The distance between source and receiver is not consistent with the protocol of Special Relativity, which measures distances by equating the space-time interval between source and receiver. This challenges the Minkowski application to Special Relativity.
- Rather than Special Relativity theory Spencer uses the distance from the source to receiver, BOTH measured at the instant *t* of reception.
- The spherical wavefront center is always at the source (even if the source is accelerated).
- There is no time dilation.
- For a source with instantaneous velocity ***v***, the velocity of light is not a constant ***c*** but is ***c*** + *v*. The Hefele-Keating data supports Galilean relativity, not Special Relativity.
- Only in a coordinate system in which the source is stationary is the velocity of light equal to *c*.

Claims and Responses

Claim #1: The determination of time dilation is done in the rest reference frame and not by observers in any inertial reference frame measuring objects/events in another inertial reference frame. Using this single rest frame, Lorentzian transformation disagreements with time and length measurements by observers in different inertial reference frames are eliminated.

Response: Since the single rest frame, the extended Earth axis, is the only absolute reference frame in which Special Relativity theory formulas predict the time changes correctly, this absolute reference frame must be very significant to cause the frequency of the Cesium clocks, thousand of kilometers away, to modify their frequency in response to the direction and speed of the jets carrying them, in preference to all other reference frames. Because the rest reference frame is part of the methodology of Special Relativity, it must logically be a partial cause of actual time changes in these remote atomic clocks. But is it logical that a far distant imaginary axis be a cause of actual frequency changes in atomic clocks, that is, without an intermediate medium to transmit the cause to the effect, namely, the ether?

Claim #2: The Hefele-Keating experiment indicated by means of one clock, #447, that accelerated clocks, moving between events by different spacetime paths, do not accumulate any net time difference when they are brought together again. If dependable, this says the proper times in all reference frames accumulate at the same rate, independently of space-time paths, and thus support a view that the Special Relativity theory 'proper time' is a universal time rate that is the same for all reference frames.

Response: First of all, if this one clock confirms the conclusion, the other three disprove it. Second, the proper time system used by Hefele-Keating was an unacknowledged absolute Geocentric frame that will predict the observed time differences with other reference frames. This confirms Geocentrism, not Special Relativity.

Claim #3: Hefele-Keating confirmed Special Relativity theory time dilation for both clocks. The accelerated airborne clocks read uniformly less than the non-accelerated Earth-bound clocks readings, an indication that time had been dilated, and a confirmation of relativity, which predicted time dilation for accelerated/decelerated clocks.

Response: Eastbound clocks incurred time dilation – ticking slower than the ground clock, said to confirm Special Relativity. Westbound clocks incurred time contraction – ticking faster than the ground clock, also said to confirm Special Relativity. But dilation/expansion is not the same as contraction/shrinking!

Claim #4: Special relativity predicts the time difference found by Hefele-Keating when the flying clocks returning to the start.

Response: Hefele-Keating said:

> ...consider a view of the (rotating) earth as it would be perceived by *an inertial observer looking down on the North Pole from a great distance.* A clock that is stationary on the surface at the equator has a speed RΩ *relative to nonrotating space*, and hence runs slow relative to *hypothetical co-ordinate clocks of this space* in the ratio...

Note that the timing in the Hefele-Keating experiment was *not* done by "an inertial observer looking down on the North Pole from a great distance"; it was at the U.S. Naval Observatory, which is on the ground, near and spinning with the equator. In Einstein's Special Relativity, where there is no preferred inertial system, relative to *this remote axial clock* the speed of both flying clocks would be *equal*, and the time dilation as well.

But the eastbound clocks lost time and westbound gained time. So we have another clash between observation and Relativity.

Claim #5: Hefele and Keating concluded that these results provide an unambiguous empirical resolution of the famous clock 'paradox' with macroscopic clocks.

Response: Others say the results highlighted the paradox vividly, rather than resolving it. The original twin paradox was independent of path. The Hefele-Keating experiment result puts the focus on the amount of East/West motion. Consequently, aging now depends not just on $|\mathbf{v}|$ but also the direction relative to longitude and the change in altitude, that is, path dependence, not just the endpoints. One twin *is* older than the other, by the Hefele-Keating experiment. A much bigger paradox – an outright contradiction, in fact – is how this asymmetric result can be explained within either Special Relativity or General Relativity, or any other relativity theory. How can an absolute frame of reference be absolutely needed in a paradigm that says all motion is relative? How can Special Relativity theory become Special Absolutivity Theory, without anyone noticing or acknowledging the illogic?

Claim #6: If a moving clock is brought back to its starting position it should show a difference in the time registered compared to a stationary observer.

Response: No one supporting Special Relativity theory said this before the Hefele-Keating experiment. A few who are immune to logic said so afterwards. A permanent difference in the clocks violates the whole concept of Relativity. The Lorentz transforms would not be reversible if a change in view is made from the ground to the plane and then back again. There has to be something different about the traveling clock that makes it 'tick' more slowly. That difference is its motion through the ether seen from the absolute Geocentric frame.

Claim #7: The traveling clock has to first accelerate to reach a certain speed, and it is this acceleration that 'causes' the slowing down of the traveling clock.

Response: This is one of many excuses put forth by Special Relativity to escape the Hefele-Keating results, that is, one denies that Special Relativity is applicable to the Hefele-Keating experiment. Later tests show the total time difference observed is dependent on how long the clock moves at constant speed and not on how that speed was reached – the acceleration. If two clocks receive the same acceleration and reach the same velocity, but one travels at that constant velocity for much longer than the other, the two clocks show different times relative to the ground clock. If the time difference was due to acceleration, the Lorentz formulas should be expressed as a function of the acceleration, not the velocity. The time dilation is due to duration of velocity, not acceleration. When time dilation has no connection with the cause of motion (acceleration), the cause must be sought elsewhere – in a universal environment of space, the arena in which all events occur.

Comments

Each atomic clock, even the surface clock, was considered to be in motion relative to the central reference frame. In the original Special Relativity theory of Einstein, the "at rest" reference frame could be taken as any of the moving objects. (Einstein died in 1955, 16 years before the Hefele-Keating experiment.) For agreement with the data, the Special Relativity theory rest clock must be at the center.

The use of an ECI reference frame located on the extended axis of the Earth was based on prior knowledge that the USNO atomic clock would not allow Special Relativity formulas to work with the raw data. It was already known that Special Relativity would only work with a remote absolute reference frame on the Earth axis, such as "a non-rotating point high above the North Pole."

The Hefele-Keating frame chosen was a Geocentric frame, with the distance from Earth assuring that the gravitational potential would not be a factor. Hefele-Keating knew the traveling clocks would be moving non-inertially with respect to a ground clock and the ground clock would be moving non-inertially on the rotating Earth, precluding a highly accurate test for Special Relativity theory. So they switched from the ground clock to a hypothetical (and unobservable) clock located at the center of the Earth. Since the surface clock would be moving at a fairly uniform speed compared to this hypothetical central clock, the time on the central clock could be represented as a fixed offset from the ground station clock, or be absorbed in a re-definition of a second. By this transformation, it was possible to pretend that the ground clock and both plane clocks were all traveling more or less inertially with respect to the earth centered clock. This approach works, not because of the success of Special Relativity theory in this situation, but because Hefele-Keating are forced, in order to obtain correct results, to use the Geocentric system.

When physicists calculate time dilation, they neglect the Earth's spin. According to Hefele-Keating, time differences depend entirely on the absolute rotational velocities of the airplanes. Putting aside Relativity theory, contemporary physicists *prefer* the Earth Centered Inertial frame (Geocentrism) to make their predictions correct *in practice*. Without fanfare, discussion, or explanation, they quite deliberately ignore the reference frames of the non-rotating aircraft and the non-rotating, *non-orbiting* Sun, or even the rotating ground stations. Why? One reason – only the Geocentric worldview works. The emperor – Einstein – has no clothes.

Einstein abolished "absolute time," considering it immeasurable and irrelevant. Physics has since advanced without any way of definitively measuring time in an acceptably objective way. Relative time is counter-intuitive to the understanding of time held by Galileo and Newton. Without this logical base, confusion arises when the common sense of time is replaced by the twisted ideas of Special Relativity. The Hefele-Keating experiment revealed that changes in time depend on absolute speed through space – the vector sum of the Earth's rotation and airplane speeds – rather than on the relative velocities of the clocks, as in Special Relativity.

Only a few space scientists (and so virtually nobody on earth) know that the Earth's ECI/Geocentric frame is always used for near space navigation and for local phenomena, while the solar system barycentric (SBC) frame is used for trans-planetary navigation and deep space phenomena. Even fewer know that, directly or indirectly, explicitly or implicitly, the SBC system values are transformed into the Geocentric frame to get results that agree with the predictions of Relativity. With all calculations buried out of sight in the bowels of computer programs; with the specialized and sophisticated code employed, translatable only by the initiated, this practice can be hidden (and denied), just as a school boy can bury a fudge factor in a sea of lab report data, to get the standard "correct" result.

Despite the dubious protocol and analysis of Hefele-Keating, later experiments using atomic clocks, aircraft, satellites and rockets have proven that time slows down the faster you move. In 1975 Professor Carroll Alley tested Einstein's theory using two synchronized atomic clocks. One clock was flown on a plane for several hours, while the other clock remained on the ground. Upon return, the clock on board the plane was found to be ever so slightly slower that the one on the ground. This was not due to experimental error, and has been repeated numerous times with the same result. This difference in time is even more pronounced today in satellites such as the space station and Global Positioning System.

This is because satellites are traveling at speeds much faster and for much longer periods than possible in an airplane.

Ether Drag Model

Suppose Hefele-Keating had interpreted the results using an ether that doesn't rotate with the Earth and extends high into the atmosphere. This choice of a rest reference frame would work with the formulas and have the correct choice of coordinate system. The ether that is dragged with the Earth's motion comes into direct contact with the atoms in all of the atomic clocks. There is thus a physical connection established between the Lorentzian formulas of Special Relativity and the ether that causes resistance to the atomic motions in the clocks. This is far more logical than the Hefele-Keating remote axial frame that offers no physical cause for its importance or necessity!

In Einstein's Special Relativity theory *any* two moving reference frames could be *directly* compared to each other. In the ether drag theory, two reference frames can only be compared to each other indirectly, by comparison of each to its ambient ether (essentially a local absolute reference frame) and then, calculating their interrelationship *via* the intermediate ether, a two step process. The meaning of ambient ether here is that it fills all space and flows, a dynamic mode, not static.

In the Hefele-Keating experiment, westbound flights fly with the ether wind causing less resistance and running faster than a stationary clock. And vice-versa, for the eastbound flights. The ether theory has no problems with the clock or twin paradox and makes exactly the same predictions as the Hefele-Keating version of Relativity as to whether the clocks speed up or slow down relative to a stationary clock, and by how much. This is true because both the Hefele-Keating rest reference frame and the ether drag reference frame are the same coordinate system – the Geocentric paradigm.

With the ether drag theory, the Hefele-Keating experiment proves the existence of the ether wind. But whether it is the Earth that rotates and drags the ether with it, as stated by Michelson, cannot be determined by Hefele-Keating experiment alone. For the rotation of the Earth through this ether has the same effect as if the Earth were stationary and the ether was moving – a re-discovery of Mach's principle, keeping the Geocentrism option open. In the Geocentrism mindset the ether wind speed detected by Hefele-Keating is the same as the [alleged] rotation velocity of the earth! From an ether perspective, the Hefele-Keating experiment can only be satisfactorily resolved by assuming a universal and absolute reference frame and a medium that transmits light.

(Note: there are two experiments that indicate that not only does ***c*** vary by altitude (ether density), but also that in the denser ether ***c*** is faster. Dayton Miller is one, Hefele-Keating the other).

Summary

1. Acceleration during the trip had no effect on the results, only the height and speed of the planes.

2. As also found with Global Positioning System operations, the results were only consistent if the reference clock was in the Earth Centered Earth Fixed frame - the Geocentric frame!

3. Hefele-Keating claim the results support Special Relativity, yet the round-trip in either direction should produce no net time dilation when the clocks are returned to the reference clock and record zero relative motion! If the on-board clock were taken as a reference, then it would show the same results compared to the Earth clock, so each one would be 59 ns slower than the other. This is the unrebutted Dingle paradox of time dilation - a simplification of the famous twin paradox! If A < B then B < A! That such illogical thoughts and defiance of reality can occur among objective scientists is incredible. So confused are the experimenters that they seem quite willing to plug numbers into an Einstein relativity formula, without ever asking if the result makes sense.

4. Not only the experimenters but all the relativity advocates accept this as a confirmation of Special Relativity!

5. These results, confirmed by Global Positioning System observations, actually show the Earth is a preferred reference frame, a surprise to all but the geocentrists! There can only be a permanent change in the time readings if there is an asymmetry, a lack of relativity, an absolute reference frame!

6. There is no doubt that a *deus ex machina mathematica* will be employed to brush this result away from challenging relativity – just as Michelson never even considered the most obvious answer to his ‘null’ result, that the Earth and the ether were not moving.

7. The success of the experiment depended on using a third reference point called “proper time.” Introduction of this extra and required reference

point takes relativity out of consideration because it's simply a euphemism for hidden ether (universal reference frame).

There is no sense in emphasizing the Hefele-Keating errata. Alley and others have confirmed the sense of the experiment by iteration. Satellites afford a better test of time dilation and synchronization of moving objects in near space.

The Hefele-Keating experiment is unique in three ways:

- Two professional experimental physicists performed the design and execution of an important test of relativity with all the care, forethought and intelligence of a high school physics lab experiment.
- Their interpretation, along with other mainstream physicists, that the results confirm Special Relativity, boldly contradicts common sense and the simplest understanding of Special Relativity theory postulates.
- The biggest surprise is that the flubbing of the experimental protocol and the gross misinterpretation of the readings went without comment in the mainstream journals, and were noted only in the physics backwaters, as cited above.

Even more intimidating, perhaps this situation is not unique to Hefele-Keating but may be prevalent in most leading-edge science pursuits, especially where prestige and funding are at stake. This consideration is true not just for Relativity but for cosmology, geology and biology, as well.

Global Positioning System (GPS)

Claim: The Global Positioning System (GPS) is the Earth's only fully functional satellite navigation system. It is a constellation of more than two dozen satellites that broadcast precise timing signals by radio to electronic receivers, which allow them to accurately determine their location (longitude, latitude, and altitude) in real time. The GPS is a marvelous laboratory for testing Relativity theory because the orbiting and ground atomic clocks have differing gravitational potentials and high relative speeds. Their high precision confirms predicted relativistic clock corrections to less than one percent. The Global Positioning System needs universal synchronization of satellites and ground stations; the preferred reference frame is the ECI reference frame.

Response: Note the following:

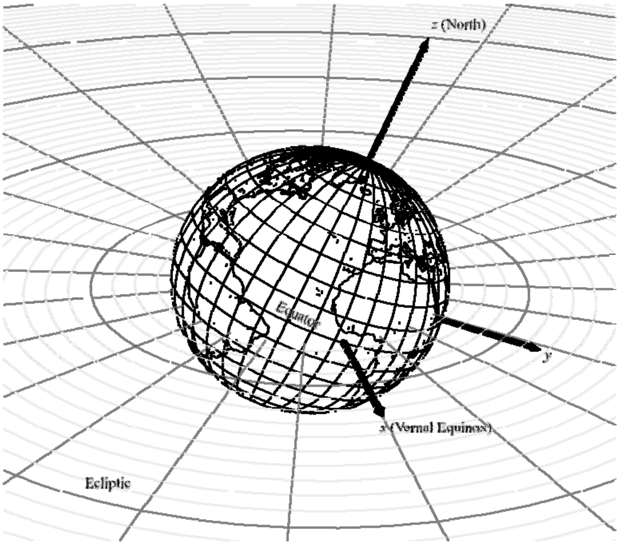
- Not an experiment, but a technology whose successful daily operations support Geocentric cosmology and challenge Relativity theory dogma.
- All high precision Global Positioning System applications correct for the Sagnac effect, indicating that the speed of light is not always constant to the moving observer. The Sagnac effect in Global Positioning System operations are in conflict with Special Relativity.
- Global Positioning System computations locate moving receivers by including the $\mathbf{v} \pm \boldsymbol{c}$ Galilean model.
- ECI is the standard technical name for the Geocentric frame.

Further Details

The Global Positioning System is a satellite-based navigation system consisting of a network of 24 orbiting satellites that are eleven thousand nautical miles in space and in six different near-circular orbital paths. The satellites are constantly moving, making two complete orbits around the Earth in just under 24 hours at about 3.6 kilometers per second. The satellite orbits are roughly 25,000 kilometers from the Earth's center, or 20,000 kilometers above the surface, far below the orbits of the geosynchronous or geostationary satellites. The orbital paths of these satellites take them between roughly 60 degrees North and 60 degrees South latitudes.

The satellites contain precise atomic clocks whose rates depend both upon satellite velocity and altitude and are stable to one part in 10^{14} over a day's time, at best accurate to about 10 ns (10^{-8} sec). An observer with a Global Positioning System receiver on the ground, in an airplane, or in a satellite, may determine his precise location by obtaining signals from several satellites simultaneously. The Global Positioning System receiver determines its current position and heading by comparing the time signals it receives from the Global Positioning System satellites and triangulating on the known positions of each satellite.

The positions of the Global Positioning System satellites are predicted from time delay calculations that set the speed of light to a constant value, *c*. The U.S. Department of Defense uses radar to map the satellites to reference points on the Earth's surface; and correction data is sent back to the satellites every few seconds.



ECI frame[295]

If the frame is Earth-centered but does rotate, it is non-inertial and termed ECEF: Earth-Centered, Earth-Fixed. The clock rates are not adjusted for motion relative to each other but all refer to the Earth-Centered, non- rotating Inertial frame, the ECI frame.

Ephemerides are expressed in the ECEF coordinate frame, which is Earth-fixed. Global Positioning System stations broadcast the satellite ephemerides (schedule of orbit positions) in an Earth-Centered, Earth-Fixed reference frame rotating once every 24 hours. If used without removing the underlying Earth rotation, GPS would be in error, so the ephemerides are transformed to ECI using the Earth rotation rate.

Because of frame rotation, the path of a signal in the ECEF is complex. In the Global Positioning System, synchronization is performed in the ECI frame, which solves the problem of path-dependent inconsistencies. The displacement of a receiver on the surface of the Earth due to the Earth's rotation in inertial space during the time of flight of the signal must also be taken into account. For example, the greatest distance between satellite and receiver occurs when the receiver is on the equator and the satellite is on the horizon.

Correction must also be applied by a receiver on a moving platform, such as an aircraft or another satellite, by an observer in the rotating ECEF frame. This is the Sagnac effect, the same principle employed by laser ring gyros in an inertial navigation system.

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[295] http://celestrak.com/columns/v02n01/fig-1a.gif

Global Positioning System Clocks

Cesium atomic clocks operate by counting hyperfine transitions of cesium atoms that occur roughly 10 billion times per second at a very stable frequency provided by nature. The precise number of such transitions was originally calibrated by astronomers and is now adopted by international agreement as the definition of one atomic second. To achieve high location precision, the ticks of the atomic clock must be known to an accuracy of 20-30 nanoseconds. Because the satellites are moving relative to and above ground observers, Relativity must be taken into account.

The Global Positioning System is based on the principle of the constancy of ***c*** in a local inertial frame: the Earth-Centered Inertial (ECI) frame. Time dilation of moving clocks is significant for clocks in the satellites as well as clocks at rest on the ground.

Special Relativity predicts that the on-board atomic clocks should fall behind ground clocks by about 7 microseconds per day because of the slower ticking rate due to the time dilation effect. General Relativity predicts that satellite clocks will seem to tick faster than the surface clocks by 45 microseconds per day. The total relativistic effect is about 38 microseconds per day. This is a huge difference compared to the required accuracy, that is, 38,000 ns as compared to 25 ns, the former being 1,500 times larger.

To compensate for the General Relativistic effect, GPS engineers slow down the satellite clock frequency at pre-launch so that when the satellites are orbiting the clocks will have the same rate as the reference atomic clocks at the Global Positioning System ground stations. A clock whose natural ticking frequency has been pre-corrected on the ground for relativity changes in orbit is a “GPS clock.” A Global Positioning System clock can be used to determine local time in the surface frame at any point along the orbit. The satellite clocks are reset in rate before launch to compensate for relativistic effects by changing the international definition of the number of atomic transitions that constitute a one-second interval. With this re-definition, the clocks onboard the satellites run at nearly the same rates as ground clocks.

Global Positioning System receivers have a built-in computer chip that does the necessary relativistic calculations to find the user’s location. Since the ground receivers rotate in ECEF, satellite positions change with each measurement. So the receiver must perform a different rotation for each measurement made into some common inertial frame. After solving the propagation delay equations, a final rotation must be performed into the ECEF to determine the receiver's position. This complexity – where ground and satellites are both moving – is simpler to describe in an inertial reference frame, ECI, centered at the earth's center of mass, which center is moving at constant velocity. For the solar system, an International Celestial Reference Frame (ICRF) is similarly defined, centered at the solar system barycenter.

It can be shown by sample configurations that path-dependent discrepancies in the rotating ECEF frame are inescapable by any practical means, while synchronization in the underlying ECI frame is self-consistent. For the Global Positioning System this means that synchronization of the entire system of ground-based and orbiting atomic clocks is performed in the local inertial frame, or ECI coordinate system.

Claims and Responses

Claim #1: The choice of ECI is arbitrary; any inertial frame can be used in Special Relativity.

Response: This is quite disingenuous. Would it be used if it didn't work? Has not modern physics emphatically asserted that the ECI frame is wrong, that the Earth rotates within a sphere of stationary stars? Why is ECI the only acceptable coordinate system for successful Global Positioning System operations?

Claim #2: All laws of physics are equivalent in any inertial frame.

Response: Yet the comparison of Global Positioning System satellite signal frequencies using their relative motion differs from that obtained using the Geocentric frame, which is known to be valid experimentally. Special Relativity theory proponents claim there is no compulsion in choosing the inertial reference frame most convenient; and in the case of the GPS, this arbitrary choice just happens to be the Geocentric inertial frame. But this is not a matter of indifference, since using a satellite receiver as the observer in Special Relativity theory does not predict the observed frequency shift, but the Geocentric frame does.

Claim #3: The Global Positioning System is 1000 times more accurate than the Miller or the Michelson-Morley experiment, and it rules out any ether wind of more than 12 m/s in any direction.

Response: (1) Dayton Miller and the Michelson-Morley experiment found positive ether results – albeit the Michelson-Morley experiment interpretation was left unrecognized until recent analysis of the original data discovered the opposite sine waves pattern during day and night hours - as expected for ether wind. (2) The Sagnac effect applies to the Global Positioning System; it clearly detects a difference in light speed dependent on the Earth's rotation/ether flow.

Claim #4: Global Positioning System calculations obey the rules of Special Relativity, provided that one undoes the pre-launch clock rate corrections in the satellite clocks and use the Einstein synchronization convention (which Global Positioning System does not do).

Response: But the Global Positioning System becomes practically unusable if one uses Einstein's clock synchronization because clock corrections become time-variable, observer-dependent, and inconsistent between different clock pairs. Every clock would have its own time frame.

Claim #5: By the General Relativity principle of equivalence, a freely falling object in a gravitational field, such as a Global Positioning System satellite, can always be described in its own gravity-free Lorentzian frame. Height of the satellite is irrelevant, since the satellite is in free fall.

Response: General Relativity predicts time is slowed by decreased gravitational potential, so no Sagnac effect should be measured in the absence of gravity, but it is. Conversely, if a Geocentric frame measures an absolute flow of time, independent of local clock measurements but dependent on the clock appointed in Genesis (*i.e.*, the motion of the lights in the firmament), then a Sagnac experiment will measure the angular rotation of the firmament (conventionally assigned to the spinning earth) as an absolute time reference. General Relativity ascribes a change in the rate clocks run to a change in the flow of time. By contrast, the Geocentrism ascribes the rate-change as a result of failing to use the absolute Geocentric frame for time measurements. In other words, one must take into account a frame that is affected by ether density and relative motion through it.

Claim #6: Relativity predicts that clocks run slower in a stronger gravitational field or when moving faster. It is found that these two effects cancel each other for clocks located at sea level. So if a clock at either pole is the standard, a clock at the equator would tick slower because of its relative speed due to Earth's spin, but faster because of its greater distance from Earth's center of mass due to the flattening of the Earth. Earth's spin rate determines its shape.

Response: The effects are the same with a rotating universe or ether, as per Mach's principle.

Claim #7: Operational data shows that the on-board atomic clock rates do, indeed, agree with ground clock rates to the extent predicted by Relativity. Therefore, we can assert with confidence that the predictions of Relativity are confirmed to high accuracy over time periods of many days.

Response: Although the magnitude of the changes are confirmed, neither the freedom of choice in reference systems nor the Sagnac effect is confirmed!

Claim #8: By the terms of Special Relativity, all inertial frames are equivalent, so the Global Positioning System is calibrated to an "ideal user" in a non-rotating, Earth-centered frame, the simple introduction of a third inertial reference frame.

Response: A new undefined concept, "the ideal user," is introduced. Where and when did Einstein speak of such an idea? The refusal to use any frame (such as the source or observer) cannot be brushed off as a trivial choice. It defies the whole philosophy behind Relativity.

Claim #9: The Global Positioning System operates by sending (coded) clock signals from orbital altitudes to the ground. This takes 80,000,000 ns from the perspective of an atomic clock. The speed of radio signals is the same from all satellites to all ground stations at all times of day and in all directions to within 12 meters per second. The same numerical value for the speed of light works equally well at any season of the year. So the speed of light is constant. So Special Relativity theory is validated.

Response: (1) Except that it ignores the special frame needed – Earth-Centered Inertial/Geocentric frame, which means, if Geocentrism is not used, all Special Relativity theory times are invalid. (2) The speed of light is not constant, but only equal to c in the Geocentric frame. Satellites emit photons at $c \pm v$ relative to the ether.

Claim #10: The Sagnac effect can be regarded as arising from the relativity of simultaneity in a Lorentz transformation to a set of local inertial frames co-moving with points on the rotating earth. It can also be regarded as the difference between proper times of a slowly moving portable clock and a master reference clock fixed on the ground.

Response: This is very complex when compared to the simple statement of reality. The Sagnac effect occurs whenever there is motion or elevation with respect to the geostatic reference view, the Earth-Centered Inertial frame.

Claim #11: Special Relativity cannot be used to handle the case of objects and observers who are undergoing acceleration (non-inertial reference frames).

Response: Only velocity affects satellite clocks, not acceleration. (1) Cyclotron experiments have shown that, even at accelerations of 10^{19} g, clock rates are unaffected. (2) Consider acceleration with respect to the object's momentary co-moving inertial coordinates at any given instant. The accelerated motion can be considered as a sequence of inertial frames separated by infinitesimal time intervals. Special Relativity applies in each of these co-moving inertial frames, but at each instant the object is accelerating relative to its current instantaneous frame of reference. The object could be moving with a speed $\boldsymbol{v}$ tangentially to a center of attraction toward which it is drawn with a constant acceleration $\boldsymbol{a}$. The path of such a particle is a circle in space of radius $v^2/\boldsymbol{a}$, such as traversed by the Global Positioning System satellites. At any given instant the object is momentarily at rest with respect to a system of inertial coordinates, so we can define "proper" time and space measurements in terms of these coordinates. The object's acceleration causes continuous progression from one system of simultaneously co-moving inertial coordinates to another; the effect of this change will be seen in any time or space derivatives. At relativistic speeds, time and space axes are affected, so when the current frame of reference is projected back to the original or starting frame of reference, both time and distance are shortened. For an example, see the relativistic rocket problem in *"Gravitation*" by Misner, Thorne and Wheeler, section 6.2 or see the analysis at http://mathpages.com/rr/s2-09/2-09.htm. *(*3) Goldstein states:

> Consider a particle moving in the laboratory system with a velocity $\boldsymbol{v}$ that is not constant. Since the system in which the particle is at rest is accelerated with respect to the laboratory, the two systems should not be connected by a Lorentz transformation. We can circumvent this difficulty by a frequently used stratagem (elevated by some to the status of an additional

> postulate of relativity). We imagine an infinity of inertial systems moving uniformly relative to the laboratory system, one of which instantaneously matches the velocity of the particle. The particle is thus instantaneously at rest in an inertial system that can be connected to the laboratory system by a Lorentz transformation. It is assumed that this Lorentz transformation will also describe the properties of the particle and its true rest system as seen from the laboratory system.

Claim #12: General Relativity says that an object in free-fall is not acted upon by any forces (NB: gravity is not a force in General Relativity; rather, it is caused by space-time curvature) and, hence, defines its own local Lorentz frame. This applies to the entire Earth as well as the Global Positioning System satellites.

Response: The latest new Global Positioning System satellites are capable of inter-satellite tracking, which verifies the Sagnac effect. But the Sagnac effect should not exist in a freely falling frame without gravity (ether in Geocentrism). In fact, Michelson said that the orbital motion of the Earth around the Sun should be detectable in the Sagnac effect with a sufficiently huge ring interferometer covering the orbital path.

Claim #13: Special Relativity/General Relativity expects that the Global Positioning System would require an adjustment for the effect of the Sun's differential gravitational potential.

Response: (1) In the ECI frame used by Global Positioning System, clocks are not, and must not, be adjusted for the gradient of the Sun's gravitational potential. Hence, there is no valid explanation for this phenomenon, which is consistent with Special Relativity/General Relativity. This is very strong evidence that some form of ether theory is valid and that Einstein's Relativity theories are invalid. (2) Since there is only one ether that is not determined by Newtonian gravitation, Geocentrism predicts that the gravitational potential of the Sun has no effect on the Global Positioning System operation, which turns out to be the case. The Global Positioning System clock bias also ignores the effect of the Moon's gravitational potential, supporting Geocentrism and opposing Relativity theory.

Claim #14: The Sagnac effect cannot be used to detect the approximately one degree of rotation per day that is related to the equinoctial precession.

Response: Howard Hayden points out that the above proposition implies a Sagnac experiment using the inter-satellite communication links of the newer Global Positioning System satellites should yield a null result when computed relative to a frame rotating at a rate of once per year. If the abstract notion of time is slowed by decreased gravitational potential in General Relativity, no Sagnac effect should be measured. But if it is due to clocks that slow down as a function of the decrease in gravitational potential and a universal flow of time (independent of local clock measurements), then the proposed Sagnac experiment can be used to measure the angular rotation due to the orbiting Earth. The general theory ascribes a change in the rate at which clocks run to an underlying, more fundamental change in the flow of time. Geocentrism ascribes the clock rate change to an environmental effect – the ether. Universal time is kept by the divinely mandated clock, that is, the motion of the celestial universe itself. It is the clock behavior that is changed, not absolute time. We can still expect to detect the Sagnac effect caused by the ether properties.

Claim #15: Global Positioning System clocks run at a rate determined by their relative velocity.

Response: In fact, the rate at which clocks run must be computed using the clock velocity with respect to an isotropic light-speed frame. This is consistent with the Modified Lorentz Ether Theory (MLET) of Ronald Hatch and with Geocentrism, but not with Special Relativity.

Claim #16: According to General Relativity theory, the frequency of the Global Positioning System signals increase as satellite height decreases.

Response: This would violate the conservation of cycles. More cycles would be detected on the ground than emitted by the satellite. The apparent gravitational increase in energy is not real. It appears to increase only because the standard of comparison (the energy radiated by a similar atom at a decreased gravitational potential) is decreased. The higher frequency of the Global Positioning System clock at its greater gravitational potential is in fact the source of the increased frequency and decreased wavelength of the received signal.

Claim #17: In the rotating frame of reference, light will not appear to go in all directions in straight lines with speed *c*. The frame is not an inertial frame, so the principle of the constancy of the speed of light does not strictly apply. Instead, electromagnetic signals traversing a closed path will take a different amount of time to complete the circuit.

Response: Rotation is only incidentally involved with the Sagnac effect, which is the result of a non-isotropic speed of light arising any time an observer or measuring instrument moves with respect to the Geocentric isotropic frame. Special Relativity requires that the speed of light always be isotropic with respect to the observer, an erroneous requirement, as Sagnac demonstrates.

Claim #18: The Sagnac effect is caused by acceleration and, thus, is properly handled by the General Theory of Relativity.

Response: The path of the radiation from the Global Positioning System satellite to the receiver clearly follows a straight line. This observation validates the claim that the Sagnac effect is not caused by curvature of space-time, which would curve the light path. As noted elsewhere, acceleration within the Special Theory can be handled by successive infinitesimal Lorentz transformations (Lorentz boosts). If Lorentz boosts are used in the Sagnac experiment, no Sagnac effect can be expected, since the detector is always in an instantaneous inertial frame (with isotropic light speed). The velocity of light arriving at the detector from both directions ought to be the same at all times. But it is not.

Claim #19: Solutions have been offered to the Sagnac puzzle that rely upon ether-drag hypotheses, in which the speed of light is isotropic with respect to the gravitational field or the gravitational potential or the Earth's magnetic field.

Response: Charles M. Hill has shown by comparing Earth-bound clocks in the Sun-centered inertial frame with the millisecond pulses arriving from the Hulse-Taylor binary pulsar that clocks on the Earth have cyclic variations ascribed to the eccentricity of the Earth's orbit around the Sun. Geocentrism attributes this heliocentric view to the ether flow caused by the precession of the equinoxes, the annual North-South galactic motion. The component of this clock variation due to seasonal Milky Way and solar system motion clearly indicates that the Earth does not drag the surrounding ether with it, otherwise there would be no cyclic variations in the pulsar data. With the pulsar data we can now measure the variation in the ether flow.

Claim #20: The Lorentz Ether Theory (LET) says that any inertial frame we wish can be used as the isotropic light-speed frame—we simply cannot tell which frame is the true frame. Whichever frame is chosen as the isotropic frame, that frame defines an absolute simultaneity and observers moving with respect to that frame see anisotropic speeds of light.

Response: This is the flaw in the Lorentz Ether theory – there is only one universal absolute preferred frame in which ***c*** is isotropic: the Geocentric/Earth-Centered Inertial frame (ECI).

Claim #21: Stellar rotation must be greater than *c*, for their alleged great distances in the standard model of cosmology.

Response: The possibility of superluminality for Geocentric systems is inherent in Galilean relativity, which has no limit for the velocity of physical objects. The ether's limiting speed of propagation is also subjective at this time.

Claim #22: Nothing can travel faster than light in Special Relativity.

Response: Consider c_g, the speed of gravity – actually, the propagation speed of gravitational changes. Consideration of eclipses and binary star stability indicate that c_g must be at least 2×10^9 times faster than *c*.

Claim #23: Each clock in the Global Positioning System is synchronized *only* to an imaginary clock in the ECI frame, instantaneously co-located with the moving clock, and at a gravitational potential equal to sea level at Earth's poles.

Response: Suppose the clock rates were not biased before launch, but had their basic design rates in orbit. When Einstein-synchronized, the system of satellite and ground clocks would tick at different rates. In any inertial frame chosen, the corrections needed to synchronize with each orbiting clock would be unique to that frame and vary continuously because both clocks are rotating and accelerating. Operating the system would be a nightmare. In the actual ECI frame used in the Global Positioning System, the speed of light is constant only in that one frame, and not in any others. The practical difficulties for GPS in Special Relativity synchronization should have left some engineers wondering why the accepted dynamic model of Special Relativity caused such problems, while an absolute frame, which violates the consensus of professional scientists, provides a natural and unforced practical solution.

Claim #24: The Global Positioning System would work just as well in the Sun-centered or barycentric inertial frame as it does in the ECI frame.

Response: (1) There is a significant omission - the Earth's instantaneous orbital velocity is assumed to be constant in both frames. (2) Because gravity is assumed to be equivalent to 'space-time curvature' in General Relativity, Earth is treated as an inertial frame, even though it is orbiting the sun. Hence, the speed of light will be isotropic in ECI according to the Special Relativity postulate; and clocks will not need to be biased/offset to correct for General Relativity effects. But, of course, they actually do. In the sun's frame, the speed of light would not be isotropic on Earth, since the Earth is moving through the ether. But Poincaré's relativity principle (there is no observable difference between inertial frames) indicates that the one-way speed of light must somehow appear to be isotropic. In order to make the speed of light appear to be isotropic on the Earth, we must bias the clocks appropriately.

Additional Comments

- The ECI standard reference frame is equivalent to the Geocentric frame. The two terms may be interchanged.
- No real-time optical triangulation checks are carried out to verify that the satellites' true positions exactly match their predicted positions. Many don't realize that we do not know the actual positions of Global Positioning System satellites accurately; the ephemeris are based on models.
- In Geocentrism, one reference frame, ECI, is preferred; and speed cannot affect time as measured astronomically, but only the ticking rate of mechanical, electromagnetic, or biological clocks relative to the ECI frame.
- The speed of light is no longer a universal speed limit because astronomical time itself is never affected, either by motion or by gravity, but clocks are affected.
- When Relativity experts disagree, they can't all be right, but they can certainly all be wrong.
- Geocentrism clock behavior allows two clocks to be synchronized by comparing each with the Geocentrism frame using the usual rate formula: $f = (1 - v^2/c^2 - 2GM/rc^2)^{1/2} f_{gs}$.
- Clocks will remain synchronized in all frames when adjusted for the appropriate velocity and gravitational potential effects of the above gauge change.
- For clocks far removed from the Geocentric frame, the gravitational effect becomes negligible; the velocity is always with respect to Earth.

- Relativity isn't hard to understand, it's hard to believe.
- Tests of Relativity with the current Global Positioning System would be overridden by ground signals maintaining the satellite clocks within 1 microsecond of Universal Coordinated Time (USNO).
- Sagnac in 1913, Michelson in 1925 and Ives in 1941 all claimed that their published results were experimental contradictions of Special Relativity because they implied an absolute preferred frame.
- Global Positioning System satellites are being adjusted according to dependencies on the Sagnac effect and the gravitational potential, proven by Pound-Rebka, both of which dependencies do not require Relativity and have nothing to do with time dilation.
- The effect of velocity on clock rate is not consistent with Special Relativity predictions of dependence; but only on relative velocity between source and receiver.
- The 'constant' velocity of light is a fiction based on the illusion of proper time and Einstein's discordant prescription for clock synchronization.

When the velocity of light is measured with the GPS, we find that it is $(c - v)$ or $(c + v)$, in which v is the rotation velocity of the Earth where the cities are located. Since all other particles are measured with additive velocities $(V - v)$ or $(V + v)$ with respect to a moving frame, why can't photons obey that same rule? Initial expectations based on special relativity were that clocks in different reference frames should have different readings and rates. Yet after pre-launch rate adjustment, all satellite clocks in all orbits remain in step with all other system clocks without further adjustment, as long as the master clock is Geocentric.

It is now widely believed that no experiment is capable of verifying these postulates, even in principle, because they become identically true – a tautology – if one adopts the Einstein clock-synchronization method. They are absolutely false if universal time is used, as in the Global Positioning System synchronization convention. Simply put, GPS uses universal time because it works!

In Special Relativity, any speed greater than $\boldsymbol{c}$ proved impossible because time ceases to advance for any entity traveling at the speed of light. In Geocentrism, the Galilean transform puts no limit on speed – recall that the speed of light in the Sagnac experiment for the co-moving beam was $c + v > c$. The upper limit for $\boldsymbol{c}$ would seem to be determined by the ether properties, which are yet to be fully explored.

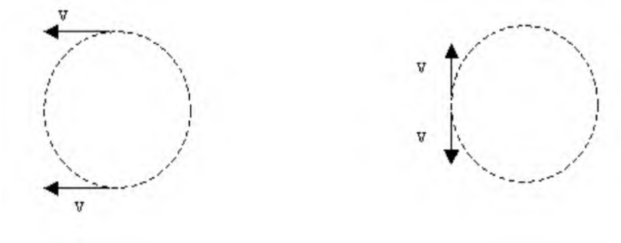
In the Global Positioning System and the Geocentric frame, possible receiver motion during the signal downlink time from satellite to receiver must be considered for correct navigation results. In the Global Positioning System context, this downlink effect is called the “one-way Sagnac effect” and is attributed to the rotation of the Earth. The critical factor is the position of the satellite at the time the signal was transmitted and the position of the receiver at the time of its receipt. The path the receiver actually followed during the downlink time is unnecessary; the time depends only on the end-points of the path.

The GPS depends on relativity in 2 ways:

1. Source velocity (Global Positioning System satellite) and receiver velocity (ground device) affect the satellite and receiver clocks.
2. The gravitational potential affects satellite and receiver ground clocks.

Velocity Impact on Clocks

The Global Positioning System satellites’ clock rate and the receiver’s clock rate are not adjusted as a function of their velocity relative to one another, but relative to the chosen frame of reference - the Earth centered, non- rotating, geocentric inertial frame. By the analysis of hypothetical counter-rotating Global Positioning System satellites, Special Relativity theory can be shown to be in conflict with reality.



Counter Rotating Satellites

Above, the relative velocity is zero; at right it is $2v$. In one half orbit the relative velocity of the Global Positioning System satellites would cycle from 0 to $2v$ and the relativity factor, gamma, would vary from:

$$1 \text{ to } (1 - 4v^2/c^2)^{1/2} \text{ to } 1$$

From either satellite, the general computed frequency f of a signal f_0 between them should be:

$$f = f_0(1 - v^2/c^2)^{1/2}$$

or a change in frequency in each quarter orbit of:

$$\Delta f = \ 0 \text{ to } 2\,(v/c)^2$$

Note well: When the satellites pass each other, Special Relativity predicts a frequency change four times as great as above, while the Geocentric system predicts no change in frequency. In a system of 12 satellites in different orbital planes, synchronization management becomes horrendous. Yet this is what Special Relativity requires, if the Geocentric frame is not the rest frame. Special Relativity seeks to avoid this embarrassment by claiming that the speed of light is constant for both the observer and receiver if the Global Positioning System uses the Geocentric frame. This answer disingenuously claims the option of choosing the inertial reference frame that is most convenient; and in the case of GPS, this arbitrary choice is the Geocentric inertial frame. But this is not a matter of indifference, since using any GPS spacecraft or ground station as the observer in Special Relativity *does not predict the observed frequency shift*, only the absolute Geocentric frame does.

Direct Global Positioning System operational evidence supports the following: Whenever a frame is chosen that coincides with the Global Positioning System satellites, experiments show that the speed of light observed is *not* isotropic, that is, the same in both directions for the observer or receiver. This is a direct contradiction of Special Relativity, which teaches that ***c*** is always constant relative to the observer. Likewise, Special Relativity's ineffective attempts to explain the Sagnac effect arise from the choice of a reference system that is not geostatic. The Global Positioning System's operational data indicate that the rate at which clocks run must be computed using the clock velocity with respect to a Geocentric frame.

Gravity Impact on Clocks

The Full Gauge theory:

If Special Relativity's gamma or scale factor is generalized by gauge scaling to include the influence of a gravity field/potential, as suggested by Ron Hatch, then:

$$S = (1 - v^2/c^2 - 2\mathrm{GM}/\mathrm{r}c^2)^{1/2}$$

then the comparative clock rate is:

$$f = Sf_{gs}$$

where f_{gs} is the clock rate at the reference level, the Earth's surface.

The reference frame for $\boldsymbol{v}$ and $\mathbf{r}$ is the Geocentric system. There is no correction for the Earth's "rotation," and the scaling measures the ether effects in a non–geostatic frame. This simple extension of the kinetic energy as the total energy, including the potential energy of gravity, explains the anisotropic Global Positioning System observations of $\boldsymbol{c}$ (and other experiments covered here) without resorting to curved space or the staggering complexity of solving the General Relativity field equations. In fact, we propose that a future theoretical research project investigate the elimination of Special Relativity and General Relativity entirely by this simple scale change and show that all General Relativity "proofs" are supported by the S gauge transformation above (in the Geocentric frame, of course).

The S gauge factor, applied to three Global Positioning System experiments, shows that clocks run slower the lower they are in the gravitational field.

1. A Global Positioning System ground station clock at Colorado Springs runs faster because of its near mile-high elevation than if it were located at sea level.
2. Global Positioning System tracking stations confirm that all clocks at sea level in a Geocentric frame run at the same rate. Note that a clock at sea level at the equator runs at the same rate as a polar sea-level clock, even though it is at a greater distance from the center (equatorial bulge), which should be a higher gravitational potential.
3. The eccentricity of the Global Positioning System's orbits causes the satellites to move up and down in the gravitational field. When the satellite is near perigee, it has a faster speed; and Special Relativity theory indicates that the clocks should run slower than normal. But near perigee the satellites have a lower (*i.e.*, more negative) potential in the Earth's gravitational field that, according to General Relativity, should also result in a slower clock rate. The effects of different orbit motion and distance have precisely the same magnitude and sign, so they combine.

The requirement that the gravitational potential of the sun and the moon not be applied to Global Positioning System clocks using ECI gives very strong support to Geocentrism and ether theory. Unfortunately, physics has become a religion and Einstein has been accorded the status of a "god of Science". To question his theories has, up to now, been anathema.

The situation has become even more contentious for space probes and GPS satellites. The 1971 JPL document containing the equations used to model round-trip and one-way signals between a space probe and the Earth employed a Sun-centered isotropic-light-speed frame in which the probe and the detector (or observer) on the Earth are clearly moving. The JPL equations show that the speed of light was not assumed to be isotropic with respect to the observer. Instead, when a signal was in transit from the probe to the earth, it included the motions of the Earth observer, that is, Earth's spin, orbital velocity, and even the Earth-Moon barycentric motion. Although none of the engineers admit it, these equations ignore Special Relativity theory postulate II (isotropic light speed relative to the observer or sensor) and use the additive Galilean formula!

In the Hefele-Keating experiment, adjustment had to be made for the faster rate of clocks at the altitude of the aircraft on which they were carried. Shapiro showed that the gravitational potential of the sun causes radar signals reflected back from Venus and Mercury to be delayed when they are almost directly opposite the Earth in their orbits. All these experiments support the use of the gauge factor *S* in the Geocentric frame for gravitational effects on clocks.

Anderson, Bilger and Stedman make the following statement:

> The final suggestion of Michelson, that the orbital motion of the Earth around the Sun be detectable in a sufficiently gargantuan ring interferometer, is not consistent with general relativity: a freely falling point object (the whole Earth in this context) defines a local Lorentz frame.[296]

If General Relativity interpretation were correct, no Sagnac effect should be measured in this global inertial frame. But if a Geocentric frame measures an absolute flow of time, independent of local clock measurements, then a Sagnac experiment can be used to measure the angular rotation of the firmament (apparently and conventionally assigned to the orbiting Earth).

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[296] "Sagnac effect: A century of Earth-rotated interferometers," by R. Anderson, *et al.*, *American Journal of Physics*, 62(11), November 1994, p. 977.

Sagnac and Special Relativity

Global Positioning System synchronizing of clocks around the globe using radio signals must take into account the Sagnac effect, since the stars move during the transit time of the signals to the ground station. The path of the radiation from the GPS satellite to the ground station receiver follows a straight line but is affected by the cosmic rotation, as Michelson and Gale showed. There is no centrifugal acceleration at the ground station, since that frame is GC/ECI. Special Relativity erroneously requires that the speed of light always be isotropic with respect to observers and the Sagnac effect exposes that error.

Sagnac and General Relativity

The published General Relativity results applied to Global Positioning System operation (assuming they have been properly derived) are in conflict with Special Relativity to the extent that they do not give isotropic light speed with respect to the moving observer. All high precision Global Positioning System applications correct for the Sagnac effect, indicating that within General Relativity the speed of light is not always seen as constant by the moving observer.

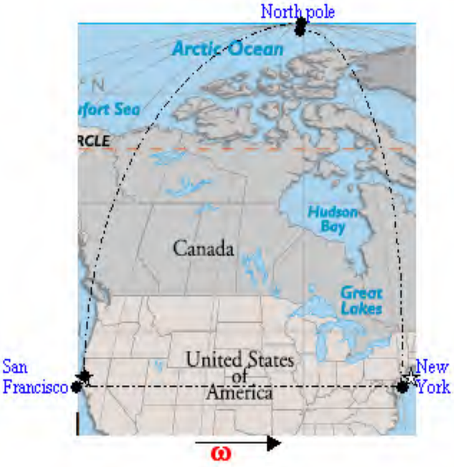
Ether

Special Relativity assumes the apparent equivalence of inertial frames is real. It uses that assumption with a universal ***c***, to derive length contraction and clock slowing. Ether theories use clock slowing to show that the equivalence of all inertial frames and common universal speed of light is only apparent/phenomenological. Motion with respect to the ether and its density causes the difference in clocks compared to the absolute timepiece.

Using the Global Positioning System satellite relay system, electromagnetic signals have been found to travel slightly faster around the planet from west to east than from east to west. This implies that a weak etherosphere – the local firmament – actually moves west to east, counter to the main stellar rotation, which is east to west. If we assume this near zone ether/firmament is responsible for the mysterious westerlies in the temperate zones, then this ether must have zonal motions similar to the global patterns of air circulation, as modified by solar heating and convection.

From the Sagnac analysis, Global Positioning System satellites would be affected by sidereal period fluctuations ranging from 0 ns (orbits perpendicular to ether flow) to 16 ns (orbits parallel to ether flow). However, fluctuation changes to their clocks could be interpreted as small variations from circular orbit, and so the effects can be masked. Other experiments besides the GPS can test the difference of synchronization between clocks, like the North-South displacements of clocks.

New York and San Francisco are approximately on the same latitude (40° 44' vs. 37° 52'). Radio signals sent directly between New York (N.Y.) and San Francisco (S.F.) using the Global Positioning System, as illustrated above, have a Sagnac delay of 14 ns for the E to W counter-rotational path across longitudes. This can be compared with a radio signal sent from New York to a satellite over the North Pole (N.P.) and re-transmitted to San Francisco. By correcting for additional delays from the greater transmission distance and re-transmission delays, we observe that the 14 ns difference now disappears, since rotation no longer affects the light speed. Another perspective is that the Sagnac area enclosing the angular velocity ω for the North Pole path is zero. In theory, the radio signals could be replaced by atomic clocks transported along the same path, but along the ground.



Time difference depends on path

But will the clock increase its rate because of a kinematic effect – the tangential velocity of rotation decreasing at higher latitudes? No, since it has been shown that the shape of the Earth's geoid is such that gravity potential difference between pole and New York is exactly the same for the loss of rotational velocity *v*. Both light/radio signals and physical clocks used for synchronization give an identical zero correction for the polar route. Both methods give 14 ns difference for the direct path across country.

The Geocentric description of all the above is based on replacing the rotating Earth with a rotating ether. The lack of temporal change when moving from NY to the pole is a result of the ether/firmament always terminating on the surface. Two clocks in San Francisco and in New York will be in perfect synchronization if the polar route is used. But a radio signal westbound from NY to SF is faster than this by about one millionth (10^{-6}) of the total transmission time. A signal eastbound from SF to NY is about one millionth slower. This demonstrates the velocity of light with respect to an observer resting on the Earth surface is $c + v$ from NY to SF and $c - v$ from SF to NY. One must conclude that the velocity of light is isotropic with respect to a frame in which the Earth is at rest/non-rotating, which, in this case is the polar route! The velocity $c \pm v$, measured from a rotating frame, is viewed as a velocity $\pm v$ due to any linear motion through an ether flow, when measured from the absolute Geocentric system. Galilean relativity in a Geocentric frame of reference is the proper frame in which to compute dynamical physics.

The constant c of Special Relativity theory means that the distance from NY to SF is smaller than the distance from SF and NY – an absurdity to rational thinkers. The velocity of light is different in any frame moving with respect to the Geocentric Earth coordinate system. This difference is even programmed into the Global Positioning System computers for correct operations. We cannot escape that the experimental velocity of light with respect to a Geocentric moving observer is $c \pm v$.

In agreement with the rotating Mössbauer experiments, a reasonable ether theory would also predict that clock speed (or the speed of the gamma ray source or detector) through the ether affects the frequency. Ruderfer points out that the transit time effect and the clock effect would cancel each other so that a null result would be expected even in the presence of an ether drift. In spite of this correction experimenters continued to claim that it proved ether's non-existence.

The Lorentz Ether Theory (LET)

Two valid alternatives to the special theory are consistent with experimental evidence: Lorentz Ether theory and Geocentrism. Lorentz Ether theory incorporated both the Poincaré relativity principle and the Lorentz transformations, taking ether as the point of reference. Einstein added the equivalence of all inertial frames, eliminating the need for the luminiferous ether and making the Lorentz transformations reciprocal. The second *postulate* of Special Relativity makes ***c*** independent of not only the source speed (also true for waves in any medium, like water, air and ether), but also independent of the observer's/detector's speed. The frame defined by the Cosmic Background Radiation (CBR) is assumed to be the absolute ether frame for the Lorentz Ether Theory, but just any arbitrary frame for the special theory. This view is said to be supported by the moon's much reduced aberration compared to the Bradley value for the stars – appropriate to its small speed through the CBR compared to the stars. In Lorentz Ether Theory, speed relative to the CBR causes clocks to slow and rulers to contract, but in Geocentrism, speed relative to the spinless Earth causes clocks to slow. Modern versions of Lorentz Ether theory hold that the preferred frame is not universal; rather, it coincides with the local gravity field of each celestial object.

Modified Lorentz Ether Gauge Theory (MLET)

Ronald Hatch has extensive experience in satellite navigation and communication systems, especially on GPS projects.297 Hatch, a former president of the Institute of Navigation and current Director of Navigation Systems Engineering of NavCom Technologies, is one of the world's foremost experts on the Global Positioning System. In Hatch's proposed alternative to relativity, MLET, the local gravity field of each celestial object serves as the "preferred Lorentz frame." The ether is not isotropic but varies locally with each object's gravity, thus losing its claim to being universal or absolute. This theory agrees with General Relativity to first order in v/c, but corrects many astronomical anomalies that General Relativity cannot without ad-hoc assumptions. Historically, de Sitter, Sagnac, Michelson, and Ives all concluded from their own experiments that Special Relativity was falsified in favor of the Lorentz theory (LET). MLET predicts that on the Moon or planets their surface defines the reference frame in which c is constant. In Geocentrism, only the Earth has this property and is a true absolute frame.

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[297] http://www.egtphysics.net/author/ronh.htm

Global Positioning System Synchronization with Sagnac

The Sagnac effect has an important influence on GPS. It would be highly desirable to synchronize clocks in the ECEF frame. But this is prevented by the Sagnac effect. Inconsistencies occurring in synchronization processes conducted on the Earth's surface by using light signals, or with slowly moving portable clocks, are path-dependent and can vary by many dozens of nanoseconds, too large to tolerate in the Global Positioning System. Thus the Sagnac effect forces a different synchronization strategy.

The Global Positioning System procedures for synchronizing clocks around the globe using radio signals must take into account the Sagnac effect, since the receiver moves during the transit time of the signal. The Global Positioning System engineers need the "Sagnac correction" in their computer program to calculate the exact GPS time, in addition to the relativistic corrections applied to offset the satellite clocks. As we have already seen, the Sagnac effect is itself inconsistent with the Special Relativity. The Sagnac effect is not a direct result of rotation or acceleration. It simply occurs any time the receiver is moving with respect to the Geocentric frame. If the receiver is moving in the Geocentric frame, the speed of light is not constant; and the Sagnac effect is simply the adjustment for the variable c. The experimental evidence is clear that it is invalid to perform instantaneous Lorentz boosts to simulate acceleration in Special Relativity to keep $\boldsymbol{c}$ constant with respect to the Sagnac phase detector. The Sagnac effect on Global Positioning System signals in transit proves that Special Relativity "magic" does not keep the light speed constant relative to the moving receiver. That Lorentz boosts are invalid is also supported by the aberration of the light from binary stars.

There is a measurable difference between Geocentrism and Special Relativity. The Sagnac effect clearly argues in favor of the Geocentrism. The Sagnac effect measures the inertial/rotational effect of space – the ether/firmament – on the counter-rotating light beams. The area dependence, A, in the Sagnac time shift:

$$\Delta t = 4\mathrm{A}\Omega/c^2$$

measures the amount of firmament enclosed by the light paths. The possible different rotations represented by Ω include all those observed in the heavens:

- solar
- sidereal

- lunar
- equinoctial precession

Rotating Mössbauer Experiments

Unbiased analysis of the rotating Mössbauer experiment would have led to a conclusion opposite to that reached in the majority of experiments. Substantial independent experimental evidence exists that a moving clock (in the Geocentric frame) always affects the clock frequency. The null result of the rotating Mössbauer experiments actually implies that an ether drift must exist, or else the clock effect would not be canceled and a null result would not be present. The experiments actually favor Geocentrism rather than Special Relativity, which is completely opposite the testimony given in textbooks on the subject.

The GPS is very similar to the rotating Mössbauer experiments with two differences:

- Ranges are the measured results in the Global Positioning System, not frequencies.
- The sources (GPSystem satellites) are rotating independently of the observers (ground receivers rotating with the Earth).

Universal time clock

Some relativity proponents as well as some dissidents have pondered the method of capturing absolute or universal time with a physical device – that is, a clock. They suggest that:

- The rate of coordinate time would be determined by atomic clocks at rest at infinity.
- A real absolute clock would always use the same time rate, remote from and independent of local motions of source and observer. The observers would always look at this absolute clock, with a telescope if necessary.

How far have we wandered from Scripture. Although the advocates above have not recognized it, their “clock at infinity” is the heavenly clock we were given on Day Four in Genesis, the sun to rule the day and the moon and stars to rule the night. This celestial clock satisfies all the conditions required:

- Observable by anyone on earth, day or night
- Its perpetual motion never runs down
- Local terrestrial motions have no effect on it

Twin anti-paradox in Geocentrism

In Lorentz Ether theory and Geocentrism, the answer to the twin paradox is simple: the Earth's stationary frame constitutes a preferred frame. So the traveling twin always comes back younger, and there is no true reciprocity of perspective for any frames that are not equivalent to Geocentrism. Part of the problem addressing the twin paradox is the many different mutually incompatible solutions offered within Special Relativity. But all the solutions claiming to be consistent with Special Relativity involve changing inertial frames for the return trip of the traveling twin. The solution to the twin paradox in Geocentrism requires the ECI frame as the absolute frame. If we never change frames and calculate clock changes on the rocket using:

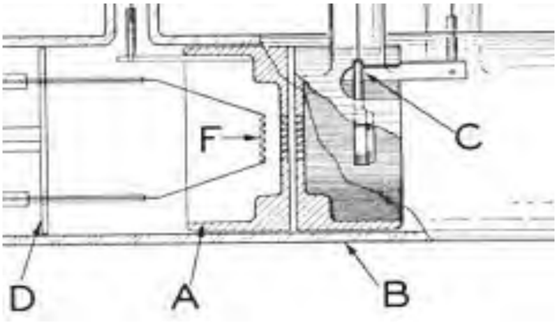
$$f_t = (1 - v^2/c^2 - 2\mathrm{GM}/\mathrm{r}c^2)^{1/2} f_{gs}$$

then the slowing of the rocket's clock or, equivalently, decreased aging of the rocket twin compared to the Earth twin, will be observed by integrating the clock rate above over the actual rocket path. There will always be a cumulative greater aging of the Earth twin, hence, there is no paradox.

The Ives-Stilwell Experiment

The experimental apparatus allowed the observation of fast moving positive hydrogen ions in two directions, with and against the motion of the particles; the observations being made simultaneously by the use of a mirror in the tube. The displaced Doppler lines observed correspond to motion toward and away from the observer – a shift of the center of the displaced lines with respect to the undisplaced line. In a glass tube ionized hydrogen atoms were created by passing a high-voltage spark through hydrogen gas.

Ives-Stilwell equipment[298]

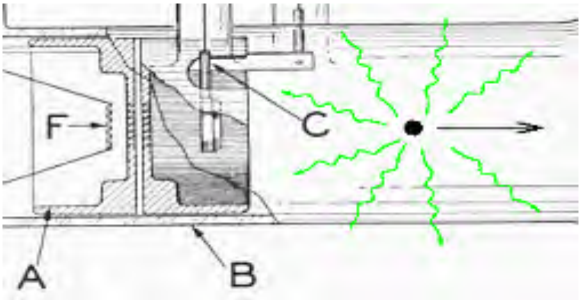


-F, A, B are electrodes
-C is a mirror to reflect horizontal light back to the source
-On the right side of the tube is a spectrograph.

Hydrogen atoms ionized by the spark between electrodes **F** and **A** are accelerated towards the negative **B** by a high voltage between **A** and **B**. Hydrogen ions combine in flight with free electrons and radiate light in all directions with wavelength characteristic of the energy level difference:

λ = 4860.09 Angstroms.

Ives-Stilwell operation



Some light rays emitted by the ions move directly toward the spectrograph (black arrow above). Others move to the left, striking mirror **C**, and reflecting toward the spectrograph.

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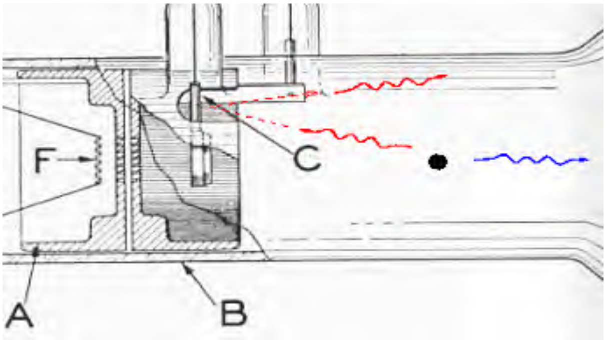
[298] N.E. Ives and G.R. Stilwell, J. Opt. Soc. Am., 28, 215-226 (1938).



There are two types of rays detected, the light directly from the source ions (to the right of black dot), and indirectly from the mirror (to the left of black dot).

Transverse Doppler Effect Theory

An ingenious way to see the transverse shift is by using two-photon spectroscopy. Two oppositely directed photons whose energy totals the excitation energy of a transition, are simultaneously absorbed by an atom. The first-order Doppler shifts are exactly opposite and cancel, leaving no first-order effect at all. For a moving atom the second order effect may be detected. Even the very tiny difference between ordinary and relativistic Doppler effects would cause a perceptible change.

Relativity theory interpretation

In classical wave optics, the direct and reflected wavelengths, λd and λr, are

$$\lambda_d = \lambda(1 - v/c) = \lambda - \lambda v/c$$

$$\lambda_r = \lambda(1 + v/c) = \lambda + \lambda v/c$$

Relativity theory predicts:

$$\lambda_d = \lambda(1 - v/c)\gamma = \lambda(1 - v/c)(1 - v^2/c^2)^{1/2}$$

$$\sim \lambda(1 - v/c)(1 - v^2/2c^2) \sim \lambda(1 - v/c + v^2/2c^2) = \lambda - \lambda v/c + \lambda v^2/2c^2$$

Likewise,

$$\lambda_r = \lambda(1 + v/c + v^2/2c^2) = \lambda + \lambda v/c + \lambda v^2/2c^2$$

The sum of the two is computed:

$$\lambda_d + \lambda_r = 2\lambda + \lambda v^2/c^2$$

The first order terms cancel, allowing the second order relativistic term to be measured, a clever example of experimental technique.

Geocentric interpretation

Ives-Stilwell showed that the frequencies of radiating ions depended on their motion. The ions emitted at a specific frequency regardless from which frame they were observed. It seemed clear to Ives that nature needed a preferred frame, whose absolute motion would determine the ion frequencies. Otherwise, how would the ions know how often to radiate? It is all in the interpretation, the eye of the beholder. Relativists say the Ives experiment confirms Special Relativity, while Ives says it refutes Special Relativity and supports Lorentz Ether theory.

Claims and Responses

Claim #1: The experiment shows that the frequency of the moving sources is reduced and given by

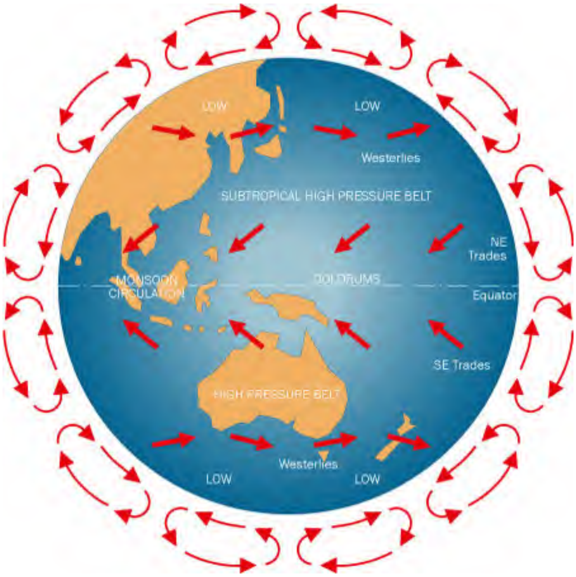
$$f = f_0\,(1 - v^2/c^2)^{1/2}$$

a classically unprecedented Doppler effect that is characteristic to Relativity only.

Response: The transverse Doppler effect is not predicted by Newtonian physics, but it is so predicted by those alternatives to Relativity theory which provide for time dilation with the *g* factor, which is virtually all of them. Specifically, Geocentrism uses the scale factor *S* to confirm the Ives-Stilwell result.

Claim #2: In 1963, Walter Kundig performed a simple experiment on the transverse Doppler shift. A rotating turntable with a central radiation source and detectors on the rim guaranteed that the relative motion is always transverse. The change in frequency detected was due solely to time dilation, agreeing with Special Relativity theory to 1%.

Response: All that can be said is that the frequency change was due to the effect of time dilation, Special Relativity theory being just one possible theory to explain the results. The results of the experiment are therefore inconclusive in distinguishing Relativity or absolute motion theories.


LOW
LOW
Westerlies
SUBTROPICAL HIGH PRESSURE BELT
NE Trades
MONSOON CIRCULATION
DOLDRUMS
Equator
SE Trades
HIGH PRESSURE BELT
Westerlies
LOW
LOW

Atmospheric Circulation is Anti-Geokinetic

The conventional model:

Global air circulation can be explained in a two-step model. The first starts with three simplifying assumptions:

- The Earth is not rotating in space.
- The Earth's surface is composed of similar materials.
- Solar heating and loss of infrared radiation cause a temperature gradient of hot air at the equator and cold air at the poles, forcing warm air away from the equator toward the poles.

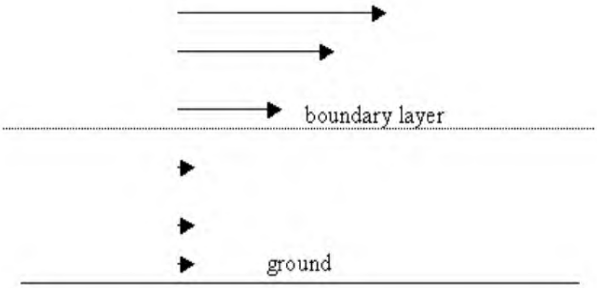
Air at the equator is lifted vertically by convection and convergence. It is then drawn to the poles by the thermal gradient. At the poles, the air cools and sinks to the surface to complete the flow cycle.

Now, let's change the first assumption to allow the Earth to spin in space. If so, planetary rotation would cause the development of three circulation cells in each hemisphere rather than one.

The Coriolis Force

Coriolis force causes upper air that is moving from the equator to deflect zonally from west to east at latitude 30°, which is the subtropical jet stream. The Coriolis effect also creates the Northeast Trades (right deflection) and Southeast Trades (left deflection). Surface air moving from the subtropics towards the poles is diverted by Coriolis acceleration to produce the Westerlies. Between the latitudes of 30° to 60° North and South, respectively, upper air winds blowing toward the poles are influenced by Coriolis forces to flow west to east, the polar jet stream. The dominant cause of west to east winds is clearly the Coriolis force.

Aerodynamic inertia should cause upper level winds to move opposite to rotation, east to west, with the greatest speed at the equator, where the tangential speed is the greatest (1054 mph), but zero at the poles. Surface air at the equator should be dragged along at the tiny boundary layer at the same rotational speed as the equator, but should increase in speed relative to the surface with increasing altitude, finally approaching 1054 mph (relative to the surface, not an inertial frame).



Wind profile with rotating earth and boundary layer

For an observer in an inertial frame far from the earth's rotational effects, the upper air would be stationary, the equator moving at 1054 mph. For a ground observer the surrounding air should be stationary and the upper air moving at 1054 mph. Let's see what sense this makes, if any:

A miniature version of the air circulation in cross-section can be seen when stirring a cup of coffee and then adding a few drops of cream. Or the satellite view of a hurricane reveals the same basic vortex pattern. The resulting principal atmospheric circulation winds should be east to west, the characteristic inertial motion of an Earth rotating from west to east underneath the air.

To understand the effect of rotation, set a solid ball spinning in a fluid as a model of the interaction of atmosphere with Earth. There should be a boundary layer at the surface with vortex lines spiraling out until the air is stationary with respect to an inertial system – the fixed stars (or the center of the Earth). The high altitude velocity profile with latitude angle *lat* should be:

$$v(lat) = 1054 \text{ mph cosine } (lat)$$

The velocity should exponentially increase with altitude at the equator from 0 to 1054 mph.

Based on the conventional Hadley cycle and Coriolis force model:

- If there is a jet stream anywhere it should be east-to-west, at the equator, but it is not.
- There is a Northern hemisphere mid-latitude west-to-east jet stream, but that is the wrong location and the wrong direction.
- There is a Southern high-latitude east-to-west jet stream, which is the wrong location.
- The highest steady winds at altitude anywhere seem to be about 50 knots, way below the rotational predictions.

Hence, it seems that the Earth is not rotating, but variable winds are caused by thermal and pressure gradients. Rotation only seems to be discussed in theory regarding the secondary Coriolis side effect, not the main feature, that is, the transition from an accelerated to an inertial frame. Remember, the Coriolis force is not unique to a rotating Earth; the same inertial forces would be present if the universe rotated around an immobile Earth. Mach's principle is still in effect, as always. But how can inertial winds of 1054 mph not play a significant role in a predictive model of terrestrial air patterns? It seems that no matter which choice for the atmosphere one takes – that it turns with or does not turn with the Earth – it defies either logic or observation.

If we are on a rotating Earth with non-viscous air subject only to gravity (*i.e.*, the atmosphere is *not* coupled or bound by any forces to turn with the Earth), then we would experience tremendous wind problems, in which the spinning Earth encounters the full weight of the atmosphere. (NB: The atmosphere weighs more than 4 million billion tons.) The minor thermal differences between poles and equator would be wiped out by the blast of west-to-east air, that is, the collision of free air and the spinning Earth.

Conversely, if we are on a rotating Earth and somehow this atmosphere is turning with us, what is the coupling mechanism that enables it to do so? It must have some link to provide the torque to continue the coordinated rotation of the Earth with its wrapper of air. Would not a co-turning atmosphere and Earth mean nothing else could move the air? Otherwise, is not the air acting as a solid, not a gas? No one has proposed a mechanism for this connection of the supposedly spinning Earth to the supposedly spinning air that is so strong that the atmosphere is forced to spin along with Earth, though otherwise it is free to move anywhere that gravity permits! We easily demonstrate the air's freedom every time we walk through it or breathe it. Yet, we are told, the air obediently follows the Earth as it twirls through the heavens.

Perhaps other planets with atmospheres can resolve this. Venus is virtually spinless; it rotates once every 243 days, with a paltry 5 mph equatorial surface speed. The upper atmosphere should be calm, but that is not the case. The wind pattern follows the spinning ball in a fluid model, with 200 mph east-to-west winds at the equatorial high altitudes, decreasing with increasing latitude and decreasing altitude, as expected, in fact, on Earth! Are there two jet streams, in opposite directions in each hemisphere, like Earth? No. High in the atmosphere the winds decrease with latitude, as the rotation model predicts. It is one big jet stream at altitude, tapering off away from the equator.

Note these words from an unusually forthright planetary meteorologist:

> Although much is known about wind patterns at Venus on a global scale, still more is unknown. It has been proposed that any planetary atmosphere is a chaotic system, meaning that there exists an underlying order about the system which, if understood, could result in accurate predictions of its details even on a small scale. However, this underlying order is unknown even for our planet, and still less is known about the Venusian atmosphere. Until that underlying order is known, the best course of action in attempting to model an atmosphere is to assume that its characteristics are truly random on all but the most global of scales.

Even this open admission of ignorance in global atmospheric physics is too conservative. We have seen that even the gross movements of the global air circulation cannot be reconciled with the rotation of the Earth underneath it. Except for stronger winds of 28,000 mph, Jupiter resembles Venus at the equator, as well as its absence of distinct jet streams. Saturn has rings as well as surface zones. Winds in the zones can be three times those of Jupiter, greater than 75,000 mph! But these two planets rotate 2.5 times faster than Earth's alleged rotation, yet the equatorial winds on Jupiter and Saturn are as much as 1,000 times faster than on Earth! The whole area of rotational effects on planetary wind circulation is very puzzling. In all the references consulted, no one seems concerned about the huge gulf between theory and reality – a hallmark of modernism.

Summary of Data and Experiments

S = supported, D = disproof,
N = neutral or does not apply

Notes: "S" for an experiment does not necessarily indicate a proof or confirmation. All empirical evidence is inductive, increasing the probability of the theory's validity, but never excluding future improvement or even abandonment. "D" in any column for a theory requires responses to remove it, otherwise there is no rational reason to maintain a paradigm that cannot explain one or more experimental results within its scope. Only experimental evidence and common experience are investigated below. Theory is discussed as it pertains to the experiment. The first row is the consensus proposed by scientific opinion, which is often far from unanimous – especially in the interpretation of results by relativists. This also holds for the summary columns. The second row of each experiment is the geocentric view.

Foucault Pendulum, 1851

Proposal: If a simple pendulum suspended from a long wire swings along a meridian, the plane of motion seems to turn clockwise in the Northern Hemisphere and the reverse in the Southern Hemisphere. This shows the axial rotation of the earth around the poles. A Foucault pendulum precesses clockwise with an angular frequency of $\omega\sin\theta$, where θ is the latitude and ω is the angular frequency of the Earth's rotation.

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: The assumption underlying this experiment is that the effect seen can only be caused by the Earth's rotation with respect to the stars. Mach's principle proves otherwise; relative rotation will cause the same result. Note that the period is sidereal, showing it is the stellar motion, not the sun, that causes the pendulum's rotation. The periodic energy source needed to sustain motion is typically an EM device. The motion is thus contaminated - not solely due to forces of gravity and inertia, but also of the EM field, which must be compensated for.

Summary: Geocentric = S, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Sagnac, 1913

Proposal: To detect the relative motion of the ether, Sagnac placed the Michelson-Morley apparatus on a constantly rotating turntable. He detected a clear non-null result – light speed depended on rotation – evidence for ether. The light source (a flashlight), the measuring device (an interferometer) and the photographic recording plate were all fixed to the rotating disc. An observer on the disc thinks that the light has completed one revolution of the disc (2πr) at velocities of $c \pm v$ in the two opposing directions.

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: Sagnac shows that light speed does *not* remain constant relative to the motion of its source or observer/detector. The reasons given for this contradiction to Special Relativity in turn contradict Special Relativity. The proof of ether and disproof of Special Relativity theory is purportedly denied using General Relativity theory to arbitrarily add a universal reference frame ("proper time"), which is exactly what ether is!

Summary: Geocentric = S, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Michelson, Gale, Pearson, 1925, 1929

Proposal: A variation of Sagnac's test on a much larger scale that detected the Earth's rotational motion, consistent with an ether medium. The aim was to find out whether Earth's rotation effects light speed near the Earth. The outcome: the angular velocity of Earth is confirmed within measuring accuracy. The measured shift was 230 parts in 1000, with accuracy of 0.5%. The predicted shift was 237 parts in 1000.

Summary: Geocentric = D, Heliocentric = N, Ether = S, Special Relativity = S, General Relativity = N

Geocentric Response: Everyplace that Earth's rotation is mentioned in physics texts can be replaced by ether rotation around an immobile Earth, by Mach's principle. The significance remains debated to this day, but the planetary Sagnac effect is now measured by ring laser gyros and taken into account by the Global Positioning System.

Summary: Geocentric = S, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = N

Ives, Stillwell, 1938

Proposal: Classic experiment that measured the transverse Doppler effect with sufficient accuracy to confirm time dilation for moving atoms – that velocity slows the rate of a moving atomic clock. This first experimental proof of time dilation measured the Doppler-shifted frequencies of an emission line from hydrogen ions in parallel and reverse directions.

Summary: Geocentric = D, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: Ives argued from this result that ions radiated at frequencies determined by absolute, not relative, motion, because they had to pick a specific frequency in which to radiate. This directly supports the ether theory and geocentrism indirectly.

Summary: Geocentric = S, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = N

Hefele-Keating, 1971

Proposal: Atomic clocks depend on rotation of the Earth. Atomic clocks flown around the world exhibit changes that agree with relativity predictions to 10%. Total time differences from general and special relativity effects were predicted to be +275 ns westbound and –40 ns eastward. The vast majority of scientists think it is irrefutable evidence of time dilation and relativity.

Summary: Geocentric = D, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = S

Geocentric Response: Rotation observed indicated a preferred reference system. Why did the H&K test cause a real and permanent physical change in the readings of the traveling atomic clocks? If the Lorentz transformation changes in length and time were a mere phenomenon of the relative motion, then when the relative motion ceased, so would the changes. But it was not so.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = D

Global Positioning System, 1993

Proposal: Global Positioning System (GPS) – the Earth's only fully functional satellite navigation system. Global Positioning System needs universal synchronization of satellites and ground stations; the preferred reference frame is the ECI reference frame. Satellites broadcast precise timing signals to ground receivers to determine their location accurately. Relativity is tested by the orbiting and ground atomic clocks at varying altitudes and high relative speeds.

Summary: Geocentric = D, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = S

Geocentric Response: The Global Positioning System's daily operations support Geocentrism and challenge Relativity dogma. All high precision GPS applications correct for the Sagnac effect, indicating that the speed of light is not always constant to the moving observer. The Sagnac effect in the GPS operations are in conflict with relativity theory. GPS computations locate moving receivers by including the v ± *c* Galilean model. ECI is the standard technical name for the Geocentric frame.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = D

Global Air Circulation

Proposal: Global air patterns are explained by thermal heating and the Coriolis force, which deflects air rotating with the Earth to form west to east airflow.

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: Let's generalize the vortex motion of tornados, hurricanes, typhoons and cyclones to the whole atmosphere itself. We would think that the rotating Earth would drag along the air right at the surface, but the lack of friction and viscosity of air, plus its inertia, would make the air stream behind the ground's motion, form as swirls of cream in a coffee cup. At the equator, which spins at 1054 mph, there would be a rapid change in the wind profile, from zero on the ground to 1054 mph at high altitudes. Testing our belief with anemometers we are surprised to learn, however, that the equatorial winds are quite docile, random and calm, even at heights. Only the sun's heat, as it crosses the sky (literally), provides gentle breezes. Using Galilean reasoning we might say: Aha! There's no atmosphere! Moderns, having made great advances in natural understanding, we laugh and say, incredibly, that the whole atmosphere co-rotates with the Earth, as if the air were solid! Theists, with a geocentric mind, say with Scriptural simplicity: "Of course there is no wind – the Earth is fixed forever. It was God who told us so.

Summary: Geocentric = S, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Part 2: Does the Earth Revolve?

Geocentrism says only the Earth doesn't move; the rest of the cosmos does. Anti-geocentrism (AGC) says the Earth moves. There are 3 modernist anti-geocentric claims:

(a) Rotation claim:
(b) Heliocentrism Claim: Earth moves around the Sun every year.
(c) Linear claim:

Part 2 covers the heliocentric claims that the Earth has an absolute and unique orbital motion around the immovable sun, the center of this system.

The Geocentric tenets are:

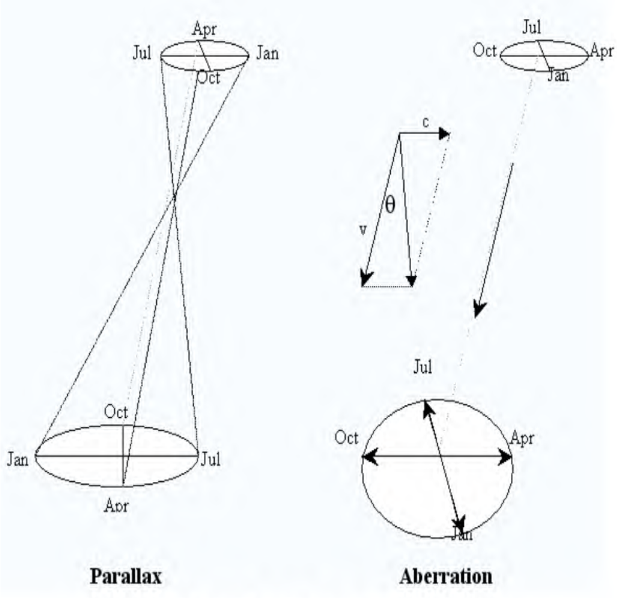
1. The foundations of the Earth do not move.
2. The sun, moon and stars (including planets) move.

The most vocal claims against geocentrism are usually centered on the optical phenomena known as parallax and aberration. It will be important to establish the difference between these often confused terms before putting to rest any merit to the idea that they disprove geocentrism.

The ellipse patterns formed by parallax and aberration are similar and, indeed, are superimposed for nearby stars. But the two stellar effects can be separated, as discussed below in heliocentric terms.

Because of the yearly change in position of the Earth, the direction in which a star is observed changes annually, as indicated above-left by the 4 months on the Earth's orbit. Unlike aberration, the parallax angle is proportional to the ratio of the diameter of the Earth's orbit to its distance from the star. Bradley observed a different periodic variation in the apparent position of stars, reflecting changes in the *velocity* rather than in the *position* of the Earth over the course of a year. This aberration effect is illustrated above right, where the star is so far away that its parallax is unobservable. The actual monthly star positions (ellipse above) correspond to the observed monthly star positions on the ellipse below, with arrows indicating the direction.

The variation on the right cannot be due to parallax, since it lags behind the variation one would expect on the basis of parallax by roughly three months. In the diagram, the angle between the direction of light with aberration ($v \neq 0$) and without aberration ($v = 0$) is θ, the aberration angle. The tangent of θ is proportional to the ratio of v, the velocity of the Earth in its orbit around the sun, and to *c*, the velocity of light. The tangent is small, so the angle θ itself can be used instead, but the angle is still considerably larger than that of parallax.



Parallax and aberration differences

Summary

There are three notable differences between the ellipses of parallax and aberration:

1. The aberration ellipse is much bigger: (20.5 arc-seconds vs. < 1 arc-second).
2. The aberration major axis is the same for all stars: 20.5 arc-seconds but the parallax major axis depends on the star's distance.
3. The phase is different. In parallax the image is 180° away from the image, in aberration it is 90° away. Alternately, when the sun and star have the same longitude, then the *longitude* shift is zero with parallax but the *latitude* shift is zero with aberration.

Parallax versus Stellar Aberration

Introduction to the concept: A review of basic logic is required in anticipation of what is to come.

Consider a basic syllogism, where **C** is the **Cause** and **E** the **Effect**.

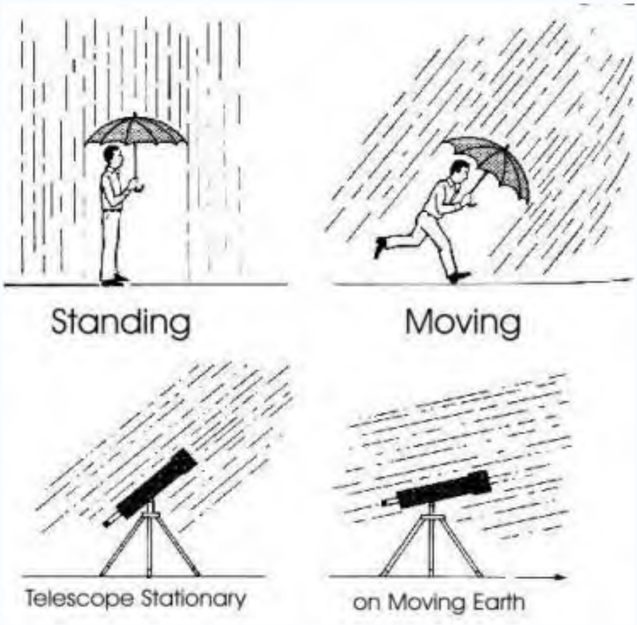
- (1) If C is true, then E is true
- (2) C is true
- (3) Then E is true

What if E is true?

If E, the effect, is true, no conclusion can be drawn about the cause. If one were to conclude that C is true because E is true, this would be the fallacy of cause-effect reversal. E could be true for other reasons than C. However, denial of the effect *does* imply the cause is not true. That is, if E is false, then C is false. This is valid reasoning.

The second preparation needed for the study of Stellar Aberration is a simple demonstration.

"c" is the rain drop speed, a model for the speed and direction of starlight rays for stellar aberration. We will model the light rays at speed ***c*** from a star as raindrops, first as falling vertically, then at a slant, as above.



A simple model of stellar aberration[299]

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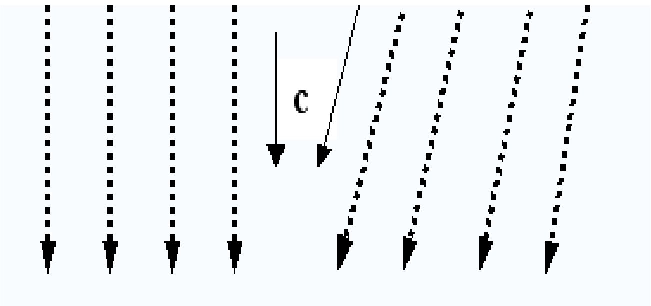
[299] http://www.maths.abdn.ac.uk/dept/einstein/Bradley .jpg

Consider an umbrella held in the rain to create a dry cylinder of air for the person holding the umbrella. When the man is standing, the umbrella is held vertically with no wind (above left), but otherwise tilted into the wind when he runs (above right). The umbrella must be tilted when the man is standing but the wind blows the rain at a slant (above right with man standing). Note that the umbrella is tilted to the right if the holder is standing and the wind is from the right, or the holder moves to the right with no wind. The tilting depends only on the relative motion of umbrella and rain.



To keep the person holding the umbrella dry in a vertical rainfall, he will do one of three things:

1. Hold the umbrella vertical.
2. If walking straight ahead, tilt the umbrella forward
3. If walking in a circle, keep the umbrella tilted forward - the top of the umbrella will also move in a circle.

To keep the person holding the umbrella dry during a slanted rainfall, he will do one of two things:

1. Hold the umbrella at the same slant as the rain.
2. If the rain is falling like a tornado vortex, keep the umbrella tilted into the rain.

For the telescope and light rays (bottom, left and right), instead of an umbrella and rain, the same logical protocol applies.

Now for stellar aberration: In 1728, a physicist named James Bradley found that his chimney telescope showed aberration circles 20 arc-seconds in size. Every star's position consisted of these tiny annual loops, flat at the equator, largest at the poles. It was understood to be caused by the orbital motion of the Earth in the same way as vertically falling raindrops appear to fall diagonally when viewed by a man walking in a circle.

Stellar aberration of light (also *Bradley or astronomical aberration*) is an apparent motion of the stars describing elliptic orbits yearly, according to the latitude of the star. The star is never seen at its true position; it appears to be displaced onto an aberration ellipse. The aberration is measured in arc seconds (″), where one degree is 60 arc minutes (′) and an arc minute is 60 arcsecs.

There are two other types of aberration, *diurnal* and *secular*, but only *annual aberration* is relevant here. Annual aberration is the component of stellar aberration resulting from the motion of the Earth about the sun.

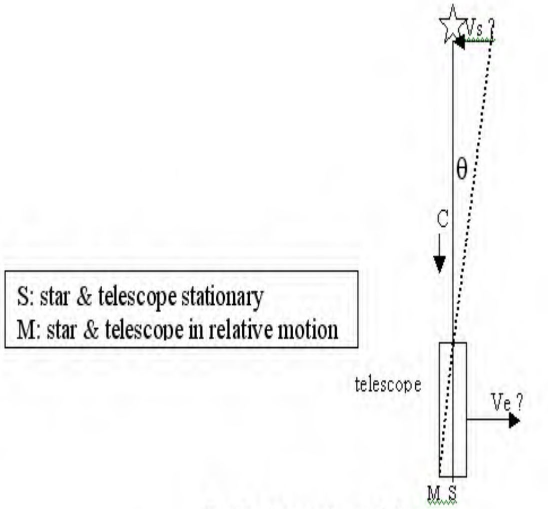
The true path of light from a star is along the straight line from the star to the observer. However, because of the component of the observer's velocity in a direction perpendicular to the direction of the star, the light seems to be traveling at an angle to the true star direction. To observe a star, the central axis of a telescope must be tilted as much as 20.5″ (seconds of arc) from the true star direction, depending on the star's direction compared to the direction of the Earth's supposed orbital motion. The orbital motion makes the stars appear to move in ellipses in the sky. All these have the same semi-major axis, 20.5″ of arc, known as the constant of aberration. The tangent of the constant of aberration is equal to the ratio of the Earth's orbital speed to the speed of light.

$$\theta = \text{arc}\tan(x/y)\sin(\text{latitude angle})$$

Bradley attributed the stellar aberration he observed as due to Earth's orbital velocity of 30 km/s relative to Newton's inertial space. He concluded that the experimental determination of the aberration constant gave the ratio of the velocities of light and of the Earth. Since the velocity of the Earth is known in the heliocentric model, the velocity of light can be found. At this time the speed of light was only estimated. The orbital velocity of the Earth is about 1/10,000 the speed of light, so the annual aberration of a star near the ecliptic is 1/10,000 of a radian toward the west (-20.5"), directly opposite to its apparent motion along the ecliptic. The aberration of light causes the positions of other stars off the ecliptic to be displaced from their average position by less than 20.5". This discovery was motivated by the search for stellar parallax but totally unexpected.

Bradley found the following:

1. The major axis of any aberrational ellipse is always parallel to the ecliptic.
2. The major axis is equal to the ratio of the velocity of light to the velocity of the Earth.
3. The semi-major axis, the constant of aberration, is 20.4955 arc seconds.
4. The minor axis depends on the latitude, being the product of the major axis by the sine of the latitude.


Vs ?
θ
C
S: star & telescope stationary
M: star & telescope in relative motion
telescope
Ve ?
M S

Bradley's experimental diagram

As seen above, aberration displacement from S to M could be due to:

(1) the motion of the Earth (Ve ≠ 0 and Vs = 0).
(2) the motion of the star (Vs ≠ 0 and Ve = 0).
(3) a combination of both (Ve ≠ 0; Vs ≠ 0).

The reasoning of Bradley, a heliocentrist, was similar to the umbrella in the rain, except in this case, the umbrella (and its dry cylinder underneath) was the telescope and the rain was now the light ray from the star. Hence, Bradley reasoned:

1. If Earth moves in vertical starlight, the telescope will need to be tilted (if C then E).
2. The telescope does need tilting (E is true).
3. Thus, the Earth moves (C is true).

This is the fallacy of: “Effect implies cause”!

If the stars and their light were moving (like wind-blown rain), then the telescope would need to be tilted. Thus, there are at least two possible causes, not one. This fallacy is a modern cosmology favorite, along with misrepresentations of geocentric explanations.

Aberration models

Neo-Tychonic view

Stellar aberration is star motion centered on the sun as viewed from Earth, hence, there is no aberration in stellar motion as seen from the sun. The aberration is due to the apparent shift in the stellar positions that are centered on the sun. This is a parallax effect due to the change in position of a reference point.

The Tychonic view

Posits that parallax, following Van der Kamp, is really stellar aberration. The objection to this view, however, is that parallax cannot be the cause of aberration because of the phase difference between the two optical effects. As such, the original Tychonic view would fail to explain aberration; the phase difference in the two phenomena rules out parallax.

Original Bradley Model

All stars had the same parallax, 20″. Those at the ecliptic poles made circular orbits, and those near the ecliptic just oscillated back and forth, as expected. Were all the stars therefore at the same distance, about 10,000 radii of the Earth’s orbit, which is about 1 light day away? Did he rediscover the roof of the firmament, to which the stars were attached, and behind which was heaven? No, the phase of the star’s orbit was 90° behind the Earth’s position in its orbit. To be parallax the positions should be 180^o out of phase.

Nevertheless, Bradley’s view is in contradiction to the modern view, known as *Relativistic Aberration*. In the Relativistic version, the apparent angular displacement of the observed position of a celestial object from its geometric position, caused by the finite velocity of light in combination with the relative motions of the observer *and of the observed object*. But in

Bradley Aberration, the apparent angular displacement of the observed position of a celestial body results from the motion of the observer.

Relativity says the ***v*** to be used in the *v*/*c* x sin(lat) formula is the relative motion between star and Earth, which can be a substantial percent of ***c***, according to red shift interpretations. But Bradley says the ***v*** must be in the heliocentric frame, so it is always 30 km/s.

Ironically, most astronomers believe these contradictory positions are both correct! The first is used to uphold Special Relativity; the second to disprove Geocentrism! The real fact is that both are wrong. The aberration is an intrinsic motion of the deep space firmament. Having a yearly period implies a connection to the ecliptic planar motion of the same period.

On Telescope Limits

Point-like sources separated by an angle smaller than the angular resolution cannot be resolved. A single optical telescope has an angular resolution less than one arc-second, but Earth-based astronomical observations and atmospheric effects make attaining this very hard. The highest angular resolutions can be achieved by interferometry: the *Very Large Telescope Interferometer* is intended to achieve an effective angular resolution of 0.001 arc-seconds. Hubble's angular resolution is 0.05 arc-seconds.

Conflict with Relativity

The theory of relativity says that events observed using light depend on the relative velocity between the source of light and the observer. At the time of the Bradley experiments, this principle was unknown. It would not be discussed until almost two centuries later, by Poincaré, and then formalized by Einstein in 1905. Bradley understood the measurements of the star Gamma Draconis as due to the proper velocity of the Earth around the sun. Earth's orbit around the sun made stars appear to be shifted in the direction of the Earth's motion. But again, Bradley's interpretation is contrary to Special Relativity, but is rarely noted in modern articles attempting an aberration disproof of Geocentrism.

In modern physics, it is generally claimed that stellar aberration occurs when there is a relative motion between a source of light and an observer, so the motion of the Earth is not absolute, but relative. This idea is based on Einstein's Relativity Principle, but it is not compatible with experimental observations. If relative motion of the stars is used in the Bradley formula, all the stars would be required to have a tangential velocity of 30 km/s, despite their radial distances varying from four light years to billions of light years. Geocentrists wait with eager anticipation how modern science is going to explain this anomaly.

Aberration and Ether

There are systematic differences in the fine details of the constant of aberration and in standard star positions as determined at different observatories, which might be explained by a variation in ether drift due to differences in the local coefficient of drag. The drag at any given station may depend upon altitude, local topology, man-made structures and the distribution of large land-masses, such as mountain ranges.

Bradley's results make perfect sense in an ether-filled universe. The effect could be caused by the ether flow or density variation between the star source and the Earth. The light speed changes while traversing the ether medium, bending according to the ether's properties and hitting the Earth at an angle, moving the image position of the star so as to form an annual ellipse. For example, stars on the equator have no observed North-South aberration component, so the ether flow in the space projected out from the equator has only an East-West flow.

Another valid interpretation is that the ether has no net effect on the starlight, but what is observed is, in fact, reality, the actual intrinsic elliptical motion of the stars. The only reason to discard this alternative is Occam's razor, which makes a subjective human judgment about the beauty and simplicity between two possible conclusions. Occam's razor sees complexity as an obstacle to human understanding, which it is, but excludes Revelation as a valid source of knowledge and is ignorant of God's perfect simplicity. Having no parts, God finds nothing complex. To Him all things are simple.

We take all of the aforementioned as a reasonable summary of the current status of the physics of aberration, except that we deny any kind of holistic or wholesale terrestrial motion and affirm the ether's motion around a stationary Earth.

Now we will answer the point-by-point contentions raised by modern cosmology's view of stellar aberration:

Claims and Responses

Claim #1: Stellar aberration is due to the velocity of the Earth in its annual orbit about the sun, that is, the deflection of a celestial object toward the observer's motion due to Earth's velocity relative to inertial space. This experiment validates other proofs of the heliocentric model.

Response: Note here that the sun apparently defines the motion of "inertial" space, although this is not stated explicitly. The first sentence expresses the belief of Bradley and contradicts the relativity of motion claimed by Special Relativity by using "inertial space" as an absolute reference for the Earth's orbital motion. Overall, heliocentrists offer no indisputable proof for their view. The allusion to geocentric disproofs is empty. Modern physics has only a few alleged disproofs, but postures as though there were many. The Galilean arguments for the phases of Venus, the moons of Jupiter and the tidal flows support both heliocentric and geocentric views, as already noted. The planetary motions measured by Brahe and interpreted by Kepler express a single possible model of the observed motions, without excluding the possibility that the Earth is not a planet (wanderer) in this system but a fixed location for observation. Newton's belief in absolute space opposes the Special Relativity theory accepted by modern physics. Heliocentrism and Relativity will always be in metaphysical conflict, though this is rarely, if ever, acknowledged.

Claim #2: Bradley based his theory on the assertion that Earth's speed is 30 km/s around the sun in order to derive the 20.5" arc aberration figure for each star. This required taking a third object, the sun, as fixed. But Einstein, in 1905, established that any point of reference can be used and the laws of physics will not be compromised.

Response: Therein is the conflict: the sun must be taken as at rest to derive the correct aberration angle, says Bradley. But Relativity says that such an assumption would make the sun an absolute reference object, which Einstein discounts. To be consistent with Special Relativity, only the relative velocity between the source star and the Earth can be employed. Moreover, this must include the radial component of the relative velocity. Why, then, do science textbooks still use Bradley's derivation, which has been disproven for 100 years? Or is it Relativity that is in error, and the sun is at rest? How can the annual aberration of starlight still be based on an average speed of only 30 km/s with respect to the sun, when modern measurements like the Cosmic Microwave Background dipole show the whole solar system is moving at 400 km/s?

Claim #3: Bradley's explanation of aberration disproves geocentrism.

Response: In actuality, Bradley's explanation flagrantly violates Relativity theory:

- by ignoring the relative motion between source and observer, star and Earth.
- by making the sun the absolute frame of reference.

Ironically, the conflict between Bradley and Relativity has been conveniently classed as a non-issue by modern physicists, apparently by a gentleman's agreement that discrediting Geocentrism is more important than logical consistency. Observations of aberration are said to show that, in contradiction with Special Relativity, stellar aberration does not depend on the relative motion between the source and the detector but exists only when the detector is moving. Why do textbooks explain the results solely when the observer is moving?

Claim #4: Aberration depends only on the speed of the receiver/viewer.

Response: Then it is asymmetric, while relative motion is symmetric. What would explain the fact that, while the observational data on stellar aberration are compatible with a moving earth, the symmetric description, when the star (and not the observer) possesses the relative transverse motion, does not apparently lead to observations compatible with predictions?

Claim #5: Light aberration does not depend on the distance of stars, only on transverse velocity of detector/observer.

Response: It is then impossible to create a converse model, that is, where the Earth is immobile and stars are moving, as everyone on Earth perceives. Relativity says there should be such an alternative model. Why is this contradiction ignored?

Claim #6: Annual stellar aberration proves that light has a finite speed, and that the Earth is moving around the sun. This is inconsistent with a simple model of light in an ether which is dragged along by the Earth, because the ether and light would move along with the telescope. It is consistent with Special Relativity.

Response: Stellar aberration is cosmic motion centered on the earth – an intrinsic annual motion of all the stars produced by the firmament, superimposed on the higher order motions of diurnal rotation and yearly precession of the equinoxes. Scientifically, parallax cannot be the cause of aberration, because of the phase difference between the two optical effects. Scripturally, aberration cannot be caused by the Earth's motion because the Earth has no motion. The Bradley solution of v/c x $\sin(lat)$ arbitrarily uses the alleged orbital speed of the Earth, implying the sun is at absolute rest. Then there should also be an additional smaller nightly component to stellar aberration due to the rotation speed, and a much larger component due to the motion of the solar system around the Milky Way, as detected by the Cosmic Microwave Background dipole, which contradicts the sun's lack of motion. So the Bradley formula is impotent.

Summary

The *Bradley* formula for aberration angle is:

$$\theta = \arctan v_{to}/c$$

where $\boldsymbol{v}_{\mathbf{to}}$ is the transverse velocity of the observer relative to the star**.** For the Earth, this is always its orbital velocity, +30 to -30 km/s.

In *Special Relativity* the formula is:

$$\theta = \gamma \arctan v_{tr}/c$$

where $\gamma = 1/(1 - v^2/c^2)^{1/2}$ and v_{tr} is the transverse velocity of the relative motion between source and observer.

The gamma term causes a third order change in the angle, which is already very small, of order v/c. It can safely be ignored in computations. The difference between the two equations is basically the reference frame for the velocity.

- For Bradley, the frame is fixed; it is always the sun – an absolute that is contrary to Relativity theory.
- For Special Relativity, the frame is relative to the source–observer motion.

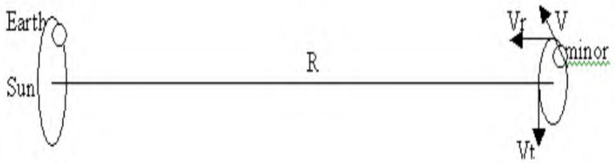
So, if Special Relativity advocates are consistent, they should reject Bradley's theory. But then their main argument against Geocentrism would be nullified! What do the heliocentrists do? Judging from current practice, use whichever viewpoint fits the current discussion, and ignore the contradiction.

Diurnal Aberration

This is referred to in the literature as if it were an observed and established fact. But no clear documentation of its unambiguous measurement can be found. The measurement of small angles in astronomy, such as the maximum 0.3″ for diurnal aberration when close to the horizontal plane, is difficult and tenuous because of the atmosphere and other influences. The accuracy of star and sun positions is ~ 2″ and all planet positions and the Moon are known to 10″. So the measurement of the diurnal aberration has probably never been made, awash in the error of other unknown or uncompensated effects. Why, then, is it described in textbooks as being consistent with stellar aberration, which has been measured?

Binary Stars

The aberration of a binary star system would logically seem to vary as the faster star in orbit changes its direction compared to the Earth's velocity in relation to the sun. For binaries with a period of a few years or less, the Earth and the orbiting star are constantly changing their relative velocity, which should imply a corresponding variation in the aberration angle of the star viewed from Earth. But this is not so. Both stars exhibit the same aberration as if they were separate single stars.



Binary stars anomaly

Heliocentric view of binary system

The radial motion V_r of the binary minor star above can be measured by its red shift. The maximum value of V_r is the same as the maximum value of V_t, the transverse velocity, when the minor star is moving perpendicular to the line of sight. The Doppler shifts of binary stars indicate their radial velocity, but this same velocity when tangential to the view from Earth does not produce the expected change from the normal stellar aberration. The predicted aberration for fast moving binary stars is never seen. Only the usual aberration of their center of mass motion is observed from Earth, the same value as for single star systems. The negative result contradicts the assumed dependence of aberration on relative motion. Logically, the claim that the Bradley aberration is due *only* to the relative motion between a source of light from a star and an observer on Earth is invalidated by the absence of aberration effects in binary star orbital motion.

Attempts to explain the absence of aberration in binary star motion using Special Relativity have not succeeded thus far. To the modern mind, this seems to eliminate all possibilities, as Geocentrism is not included in the running.

Binary Doppler Spectroscopy

Claim: Stellar aberration depends on the relative velocity between source and observer, as Einstein maintained.

Response: Then each component of a spectroscopic binary star would have significantly different stellar aberration, contrary to observation, which shows each component has the 20″ aberration of a single star. Aberration of the individual star motion within the binary system would cause distortion of their observed elliptic orbits, but this does not happen. Only the Bradley aberration of their center of mass motion is observed from Earth.

Mathemagic

Mathematics has often been abused and misused by Relativists. Advocates often obfuscate rather than illuminate by surrounding a Relativity theory application in obtuse mathematics. A fog of misunderstanding is cast over the Relativity interpretation rather than the light of knowledge for which mathematics was intended. It is instructive to see a case in point at a Web site intended to support Relativity theory with mathematics.[300] In the section titled "Stellar Aberration," a formal proof is presented asserting that Relativity theory correctly predicts the binary star aberration as single stars. The relationship derived is not coordinate-invariant (covariant), so its results cannot be generalized for other boundary conditions. In other words, the result depends on the initial choice of time and space values. Only for the specific choice of conditions is the relationship true; any other choice leads to disproof of the Relativity theory aberration formula. The example is patently fallacious, as it employed unique initial conditions that resolved the problem only for that particular choice of boundary conditions, but predicted nonsense for any other choice. This mathematical equivalent to special pleading requires careful analysis to uncover its errors. It leads one to suspect that it was buried in equations to hide its flaws.

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[300] http://www.mathpages.com/

Ether

Any motion of the ether or variation in its optical density between the star and the Earth would affect light waves traveling between them. Stellar aberration seemed to call for a completely fixed ether before the binary star anomaly was observed. The binary aberration anomaly could logically be an effect due to the local ether properties surrounding the binary system, in addition to, or in replacement of, the relative transverse velocity dependence.

As with the single star aberration, another valid interpretation is that the ether has no effect on the star light, but what is termed aberration is, in fact, observed is reality, the actual elliptical motion of the stars – the Geocentric model.

Planetary aberration

We will attempt to follow the logic of this type of aberration as presented by current scientific beliefs.

For the stars, the transit time is at least four years, so the time of flight correction is impossible to compute, thus travel time delay is ignored for stellar aberration. Under the assumption of a constant ***c*** (Special Relativity postulate #2), the transit delay within the solar system can be found if the distance is known (from independent reasoning). But the application of aberration theory to the planets leads to conflicting predictions, just as with the stellar case:

Bradley: Predicts the heliocentric speed of Earth of 30 km/s will produce a constant 20.5″ aberration on any and all planets.

Special Relativity: predicts the varying relative speed between Earth and the observed planet will determine the aberration. For example, the relative speed between Earth and Mars will vary from 0 to 65 km/s, producing 0 to 43 arc seconds shift over the years. For both of the above, the transit time delay has the same geometry as the aberration diagram, so both cause the same angular change that lags behind the true position of the object.

Ephemeris computation: To calculate the aberration and transit delay, the actual position and speed of a planet must be known – the ephemeris. In lowest order, the parameters are given by Newton's/Kepler's laws. The knowledge of the exact motion to detect aberration effects requires knowing all the influences on the orbit, including perturbations by neighboring planets and moons. This reduces the precision to 0.1 arc minutes or 6 arc seconds. Telescopic accuracy is a few arc seconds, thus, the aberration should be seen. Planetary aberration for Mercury (assuming we knew an accurate ephemeris) would be different than aberration for Jupiter (assuming the same).

Interestingly enough, the determination of aberration within the solar system, not in deep space, is now said to be impossible, because no one really knows the real location of any planet. We only know their apparent positions, the direction they appear to be as we look at them. If we knew where they were – the actual position – we would know the deflection of aberration. If we knew that, we would know where they are. But we don't know either requirement, exactly, or exactly enough.

Unlike stellar aberration, planetary aberration has not been directly measured, but inferred in building some ephemeris, such as the almanac table. This is an interesting admission. If some ephemeris include aberration in their computations, then how can they be used in an experimental verification of the same aberration? As several astronomers have pointed out, the error produced in planet orbits by perturbations of other solar system objects, and even by their own moons, exceeds the aberration correction. This is a roundabout way of saying we really don't know where the planets should be with enough accuracy to determine their aberration.

Here is the puzzle that results: the planets are much, much closer than the stars, and are subject to the well-tested gravity law of Newton. So how can we know exactly where the remote stars are, but not where Venus and Mars are, or should be? Is this another elephant in the living room? For the purposes of measuring aberration, how can we be so certain of the location of the stars, which are up to billions of light years away, but not the location of our solar system neighbors, mere light minutes away? Does that make sense?

Ephemeris only predicts the apparent positions of planets and is unconcerned with their actual locations. Let's reveal the implications. Many believe that NASA and the Jet Propulsion Laboratory make detailed flight plans based on their precise knowledge of celestial mechanics, but this is merely a modern myth. Spacecraft make numerous course adjustments during flight by dead reckoning in space and commands from ground stations.

Almanacs, such as Starpath, say they correct for planetary aberration, but what theory do they use? If Bradley is followed, they would use 30 km/s, the orbital speed of the detector. Then the correction would be the same for all planets, 20″. This is clearly a measurable size, so this cannot be it. What of Relativity's appeal to the relative speed of the Earth–planet system? If so, then why was the Earth-star relative motion not put into use when calculating stellar aberration?

The topic of aberration is such a tangle that it deserves the careful attention of objective and logical analysts to establish what, in fact, is fact and what is fiction. We must be ready to accept that only the former is true.

Moon Aberration

The relative speed of the Earth-moon pair would be the combined rotation speed of Earth and the orbital speed of the moon: only about .5 km/s – about .7 arc seconds of aberration angle, which is not really measurable. Yet the Earth-moon system together is said to be flying around the sun at 30 km/s, so that is the speed to use, when the moon is full or new. So the Bradley aberration angle is expected. Yet this is prior to 1980. Since then, the Cosmic Microwave Background dipole interpretation (and others) have determined the speed of the solar system is about 380 km/s, which is now the correct velocity to use (so we think)! But this speed will produce an aberration angle almost 13 times greater than the Bradley prediction: 4′ 20″. Double this to include the transit delay yields 8′ 40″, which is easily detectable.

Experiment:

When a Lunar Laser Ranging experiment is performed, a laser beam is first aimed at the moon toward retro-reflectors placed on its surface previously by astronauts. The retro-reflectors have an ingenious design, which always reflects the captured beam exactly back along the path of the incoming ray. If any light beam strikes the reflector surface, it will return on the same path; there's no deviation in direction, no correction angle. (See patent for a '**velocity-aberration correcting retroreflector satellite').**[301]

During the time it takes this laser beam to travel to the moon and back (about 2.5 seconds round trip), both the Earth and moon (as part of the solar system) move about 948 km towards the Leo group (474 km while the beam is headed to the moon and 474 km while the beam is headed back to Earth). Since the retro-reflector sends light back to its point of origin, and because the returning beam is only 20 km wide when it returns, the returning laser beam should miss the telescope (that launched the laser beam) by at least 928 km (948 km minus 20 km). This is because both the Earth and moon have moved 948 km towards Leo while the laser beam was in flight. But, in fact, the laser beam is detected by the same telescope that sent the laser beam originally! Thus, the Earth's own moon does not experience aberration as the distant stars do. Why?

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[301] http://www.freepatentsonline.com/5474264.html

Satellite Links: Technical background

The operations of GPS satellites and others have found that the aberration constant obeys Bradley's formula, if the relative speed of satellite and ground station is used for the transverse velocity. The 5.8″ aberration observed is the same for ground-to-satellite laser signals, or the reverse, indicating that the roles are reversible and the speed of relative motion is the cause. At this point we can eliminate the sole dependence of aberration on the motion of the observer (Bradley's contention) or on the motion of the source stars alone. The velocity aberration angle of a satellite depends on the ratio between its relative transverse velocity and the laser beam velocity (or speed of light). The transverse velocities known today usually correspond to deviation angles in the range of approximately 1 to 10 arc seconds, or speeds of 1.5 to 15 km/s.

Satellite Test of Aberration

Since aberration is independent of the distance between source and observer and the speed of the source, a laser beam calibrated on Earth to hit a target should exhibit an aberration angle when aboard an Earth satellite. According to NASA, near-Earth artificial satellites are usually computed in the geocentric system (ECEF) and do not require the usual correction for aberration in this system. Doesn't that imply that the geocentric system is inherently superior and preferable to the rotating Earth model for predicting the actual location of artificial satellites, and by extension, possibly also for all celestial motions? If not, why not?

Earth Aberration

An experiment may prove that a light source on Earth has no aberration: a beam of light from a light source passes through very small holes in a number of plates standing in a row. The beam will be blocked 12 hours later if there is an aberration caused by the rotational velocity of the Earth. Of course, if the Earth is not spinning, there will be no aberration.

Fresnel Ether Drag

Arago observed that the Earth always seems to be "at rest" in the ether. Fresnel used a drag factor to explain the difference between the absolute ether of Arago, unaffected by material motion, and a non-existent ether. This solution said that, in a moving transparent medium (water), the ether carrying the starlight is dragged along with the medium, like a boat in a river. The drag coefficient described how strongly a moving material medium "dragged" the ether. Fresnel drag is a change in the speed of light passing through a transparent moving medium, a change proportional to the refractive index and velocity of the medium. The Fresnel drag factor is:

$$1 - 1/n^2$$

for a transparent medium of refractive index n. The speed of light in the medium n has an additional speed due to the ether dragged along with the medium:

$$c' = c/n + v(1 - 1/n^2)$$

In general, 19th century physicists were strongly convinced there was an absolute ether; the dragged ether was denied. The absolute ether was at rest while all cosmic objects moved through it. Only if the Earth is at rest in the absolute ether can light travel with equal speed in all directions (isotropically). If the Earth is moving in the absolute ether, the speed of light cannot be isotropic.

Wilhelm Veltmann, in the early 1870s, showed that the Fresnel coefficient must be applied individually to each frequency of light. That is, dispersion was present, a drag dependency on wavelength. Transparent bodies have to drag along different amounts of ether for different colors of light.

The Fresnel drag effect had empirical credibility - it is solidly established by experiments. By the start of the 20th century, Fresnel drag not only explained refraction but also reflection, diffraction, and interference experiments. What it lacks is a common sense interpretation for its underlying physical mechanism for partially coupling matter in motion with ether.

Fresnel drag needed to be appended to the immobile ether concept if this theory was to explain optical experiments to first order in v/c and the

Earth were to be at rest in this immobile ether. But many physicists were unhappy that the ether was so little affected by matter. The focus from this time to the present (where the Cosmic Microwave Background is the present reference for immobility) was obviously on a stationary ether, not an immobile Earth. The immobile Earth had been discarded as an option historically, but erroneously, as we have seen so far based on Bradley aberration. Faced with a disproof of heliocentrism and confirmation of geocentrism, scientists desperately strove to find an escape path. At this time in history, the only known way of reconciling stellar aberration with wave theory was Fresnel's partial dragging. This *ad hoc* remedy gave heliocentrism a temporary reprieve, but still the question of geocentrism or heliocentrism was not resolved. The logical conclusion left at this point was: either geocentrism or heliocentrism is possible, if ether drag exists.

Claim: An objection raised against Fresnel's ether drag model is the apparent distinction between two kinds of ether, a universal kind unaffected by matter, as though impervious to this type, and a second kind carried along by transparent media.

Response: But a dual ether (or a fluid ether and a rigid plenum, more accurately) is just the conclusion drawn from the Genesis exegesis of Day 1 and Day 4 and modern experiments.

George Stokes

In 1845, Stokes attempted to account for stellar aberration on the basis of a moving Earth dragging along ether in its vicinity, in addition to the consideration of how the wave fronts of stellar light change direction when encountering the Earth's 'etherosphere.' The light ray really is deflected during its passage through the ether, not apparently. Stokes needed an alternate account of aberration because he disbelieved the hypothesis of an immobile ether.

Fresnel realized that polarization could be explained easily in the wave theory if light consists of transverse rather longitudinal waves, such as sound. To support the transverse mode, ether needed enough stiffness to supply the transverse forces opposing the distortions produced by the waves. The ether, if it simulated a mechanical system, had to be a solid. This picture of the ether conflicts with an immobile ether unaffected by the motion of matter. It was more intuitive to assume that matter was the cause of the ether drag. Stokes became the champion of this view by proposing a "Silly Putty" model of the ether. Ether behaves as a rigid solid for the high frequencies of light and as a fluid for the slower motion of celestial bodies traversing it. At the Earth's surface, the ether will be stationary with respect to it. This more realistic model of the ether was a more complicated explanation of aberration.

Stokes differed from Fresnel's partial drag theory. He interpreted stellar aberration as an ether that was totally, not partially, dragged along next to the Earth. The wave fronts of starlight change direction after entering the Earth's etherosphere. Stokes' ether was an incompressible (implies ***c*** is constant) and irrotational fluid with no viscosity to produce drag. The velocity of the ether and an object matched at the object's boundary. Incoming plane waves were tilted by the ether flow by the same amount as stellar aberration. Lorentz found that Stokes' assumptions self-conflicted, because the velocity of a potential flow past a sphere does not match the sphere's speed at the boundary. Stokes had assumed the ether flow relative to the Earth was zero at the Earth's surface; the aberration angle θ is given by:

$$\sin(\theta) = \sin(\delta)\ |V_s|/c$$

where δ is the declination of the star and V_s its velocity, as observed. The flow velocity is parallel to the surface, but it is non-zero, and can vary widely. Changing Stokes' assumptions, such as making the ether compressible to achieve zero surface velocity, introduces effects that predict a different aberration angle. Conclusion: Stokes' theory of a completely dragged ether was unsuccessful.

Faraday Rotor Generator (1831)

A homopolar generator/Faraday disc consists of a conducting flywheel rotating with constant angular velocity ω in a constant magnetic field **B** perpendicular to the plane of the disc. A conducting frame makes conducting contacts with the center and a point on the periphery of the disc. Three tests are performed:

Test #	Copper disc	Magnet	Current ?
1	rotates	fixed	Yes
2	fixed	rotates	No
3	rotate together	rotate together	Yes

Faraday's classic law of electromagnetic induction states that it is the relative motion of the circuit and the magnet that generates a current.

According to this view, test 1 and 2 should produce a current and test 3 should produce none.

Lorentz Force

All free electrons in the conduction band of the copper disc that move through a magnetic field experience a Lorentz force of F = q*v* x B, where *v* is the velocity of the electrons. This force is perpendicular to both the velocity of the electrons, which is tangential, and the magnetic flux, which is normal to the disc, and is therefore radial. The conduction band electrons, then, move radially and create a current if the circuit is complete through the slip rings.

When the disk spins without an external return path, electrons collect along the rim and leave a deficit + charge near the axis. The charge separation is proportional to the magnetic field and the rotational velocity of the disk, but independent of any rotation of the magnet. The amount of polarization is determined by the absolute rotation of the disk relative to an inertial frame. The relative rotation of the disk and the magnet plays no role.

Claims and Responses

Claim #1: If the magnetic field is provided by a permanent magnet, the generator works regardless of whether the magnet is fixed to the stator or rotates with the disc, the Faraday paradox.

Response: But as usual, the question is: “velocity relative to what?” If the velocity relative to the magnet is assumed as the cause of the Lorentz force, then the explanation contradicts Special Relativity, in which it is impossible to tell whether a uniform magnetic field is moving or stationary. This assumption would also imply that rotating the magnet and not the disc would cause a current to flow, which is not what has been observed.

Claim #2: The correct interpretation of the *velocity* of the electron is that it is relative to the apparatus parts, the sliding contacts and the external circuit. These laboratory objects act as the inanimate observer in Special Relativity. The velocity of the electrons in the lab frame must be used for congruence between theory and reality.

Response: But the lab frame is none other than the geocentric frame!

Claim #3: Faraday discovered that the magnet and disc could be cemented together and rotated conjointly, if the magnet were the same shape as the disc. The same voltage was measured with sliding contacts that touched the center and edge of the conducting disc, as when the magnet was fixed and the disc rotated alone. Was relative motion unnecessary for the generation of electricity?

Response: Note that when the copper and magnetic discs are cemented together, they both move relative to the Earth – the geocentric frame.

Claim #4: After many years, Faraday concluded that when a magnet is rotated, its magnetic field remains stationary.

Response: Stationary with respect to what? If it is the Earth or laboratory frame, then this confirms the geocentric theory! If the Earth were really rotating, all the metals in it would be generating induced electromotive forces as they passed through the Earth's own static magnetic field. And induced currents would be created wherever a complete circuit exists. But where are all these self-induced effects, which should be seen if the Earth rotates?

Parallax (1838)

Flush with the discovery of a great advance in technology (the lever!) Archimedes was emboldened to say:

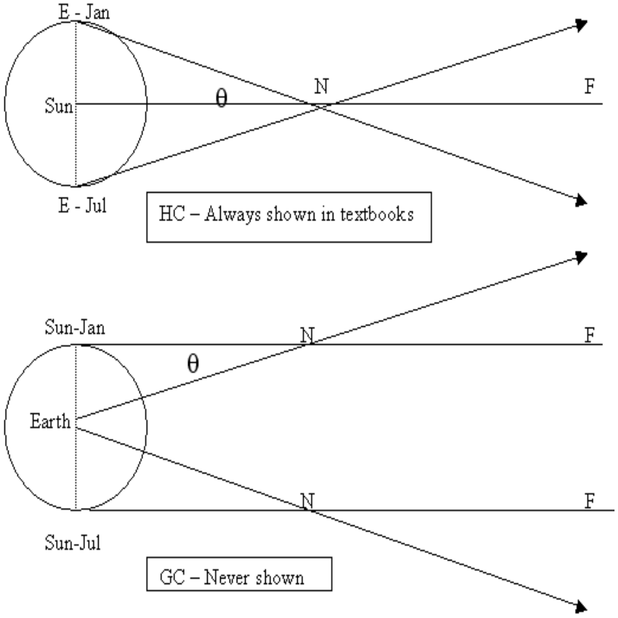
> *Give me a lever long enough, and a prop strong enough, and I can singlehandedly move the world.*

This aphorism has at least two shortcomings:

1. It boasts that the world can be moved, in direct conflict with the Scriptures: Psalm 104:5: *He set the earth on its foundations; it can never be moved.*
2. His logic also failed, in that he assumes he would have an immovable place to stand, to operate the lever.

Those who propose stellar parallax as a proof of heliocentrism and a disproof of geocentrism make the same false assumption.

Parallax can be demonstrated by placing your index finger in front of your nose and then alternately closing each eye. Either the finger or the background will seem to move, depending on your focus. But, of course, there is no real motion, only a shift in viewpoint relative to a reference point or line – your finger. This is a simple example of parallax, the shift in position of an object due to motion relative to a fixed reference line. We shall see that the whole crux of the parallax disproof of geocentrism hinges on knowing what line is truly fixed. The knowledge of what is the actual motion is impossible without a known fixed point.



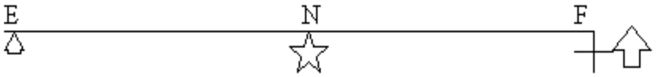
Top: Heliocentric view of parallax
Bottom: Geocentric view of parallax

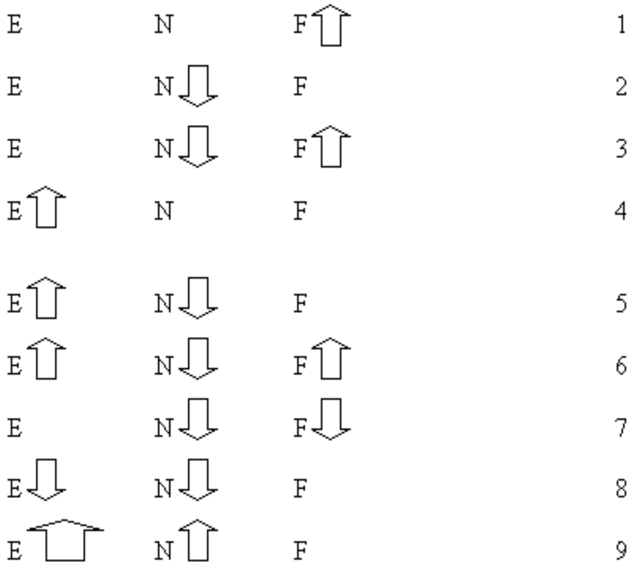
In 1838, astronomical instruments were precise enough for Bessel to first measure a parallax angle for a nearby star after six months of observation. He was the first to use parallax in calculating the distance to a star. Parallax would provide the first accurate measurement of interstellar distances, implying that 61 Cygni had a parallax of 0.314 arcseconds, which, given the diameter of the Earth's orbit, indicated that the star was ~3 parsecs or 10 light years away. His interpretive heliocentric diagram is shown below. It is always shown in science books as proof of the sun's centricity. And so it is, if, in beginning the analysis, one assumes that the sun is the fixed reference point. But this is the fallacy of *petitio principii* (begging the question) or assuming true what has yet to be proven.

Measurements of parallax by a viewer from the sun would show none, according to modern science.

The bottom diagram is a classic original, never shown in mainline science books, never even discussed as a possibility. So your eyes are two of only a few that have seen it - an equally valid alternative to the heliocentric diagram, including the size of the parallax angle, with the (a) sun (b) near star (c) far star alignment the same in both views.

In the diagram below, we sight along a near (N) star at a far (F) star from Earth (E) and see F move up. What is the inference?





From Earth, any of these 9 rows of different object motions above will look like the Far star moved up, including row 7, where F actually moves down when N does likewise. It is clear from this chart that the true state of motion critically depends on knowing what is fixed, the fiducial reference. The apparent shift in parallax can only be real if the fixed point is known independently. In the case of the Earth, the independent source affirming it is fixed is biblical Revelation. The same source affirms that the sun moves.

Dominique Arago

In 1810 Arago attempted to measure the extent to which photons would be refracted by a glass prism at the front of a telescope. He anticipated that there would be different angles of refraction due to the different velocities of the stars and the motion of the Earth at different times of the day and year. Contrary to this expectation, he found no difference in refraction between stars, between times of day or between seasons, only ordinary stellar aberration.

He also considered the refraction of light from the same star over the course of a year. Changes in the orbital velocity of the earth with respect to the star would presumably produce changes in the relative velocity of the Earth and the starlight. Arago observed no such effect on the refraction of the starlight.

Claim: Arago viewed stellar aberration through a normal lens and through a thick prism with a very different index of refraction. Again, he found no difference. Both experiments imply that the speed of light is independent of the motion of the source.

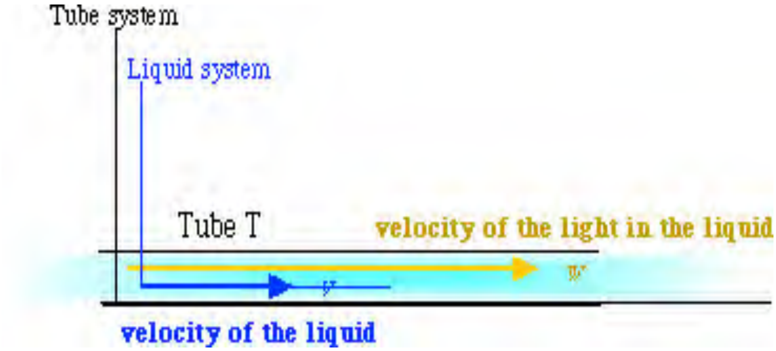
Response: They both also allow that the observer on Earth has no motion.

Fully Dragged Ether

The experiments demonstrated Earth's movement does not influence optics near the surface. One implication is that the ether is immovable with respect to the Earth (the total ether drag hypothesis). Together star aberration and Arago's experiments show that:

- the ether dragging caused by the Earth is relative only to the Earth but not the whole solar system.
- the range of the dragged ether must be small
- the ether has a pressure/density gradient.
- *c* is anisotropic.
- every cosmic body could have an ether lens that distorts light paths, as in General Relativity.

With regard to the last point, all we have is proof of the ether effect on Earth. Extending this result to other cosmic bodies is speculation, not science. In 1818, Fresnel added the drag coefficient to the immobile ether to account for Arago's result.



A telescope set up on Earth can be focused on a star that is in the direction the Earth is traveling. Two of the light beams from the star are focused at a point P within the telescope. Since the telescope and observer are moving with a velocity of 30 km/s, the observer's eyes will arrive at point P at the same time as the light beams, and the observer will see the star in focus. But 6 months later, with the same focus, the situation will be entirely different, since the Earth will be on the other side of its orbit. Now the telescope will be traveling away from the star with the same velocity. It was predicted that the observer's eye will no longer be at point P when the light beams arrive there – the star will be out of focus. A telescope that was originally in focus on a distant star should be out of focus six months later. Scientists did not measure the expected out-of-focus effect. This Arago *out of focus effect* has never been found. Besides a full dragged ether explanation, the geocentric theory of a motionless Earth also fits.

Armand Fizeau

Experiment description: In 1851, Fizeau devised an experiment to measure Fresnel's drag factor. The Fizeau optical interferometer was devised to measure very small differences in time or distance. The drag coefficient of Fresnel:

$$\mathrm{f} = 1 - 1/n^2$$

corresponds to a fringe shift of :

$$\delta = 4n^2 \mathrm{f} vL/(\lambda c)$$

λ being the wavelength of the light, v the flow speed of the water and L the path length. Fizeau recorded a shift of $\delta = 0.23$ interference lines implying a empirical drag factor of $f = 0.48$. From $f = 1 - 1/n^2$, $f = 0.43$. Within a 10% error, Fizeau confirmed Fresnel's drag factor.

Special Relativity predicts no ether but does predict that ***c*** in a moving medium differs from the speed in the rest medium, consistent with the Fresnel drag coefficient. Fizeau's experiment found that the velocity of light in a liquid is smaller than that in vacuum, depending on how dense the liquid is.

The Fizeau Theory

Fizeau used interferometry to determine how the speed of a moving liquid affects the speed of light. Light travels in a motionless liquid with a velocity ***w*** with respect to the liquid. According to Special Relativity, this speed does not depend on the liquid's motion relative to the tube T. The liquid then moves with a velocity ***v*** relative to the tube.

Theoretical analysis of Fizeau experiment[302]

In a transparent fluid at rest, the phase velocity of light, ***w* = *c*/*n***, is isotropic and inversely proportional to the fluid's index of refraction, ***n***. If ***c*** is parallel to the velocity of the fluid ***v***, then ***w*** is the *observed* speed of light in the moving fluid. According to Special Relativity's rule for addition of velocities, we have:

$$w = (u + v) / (1 + uv/c^2)$$

$$\approx c/n + v f$$

The coefficient $f = (1 - 1/n^2)$ is known as the Fresnel drag coefficient. As such, ***f*** will be 0 if the motion of the liquid had no influence on ***c***. It will be 1 if light was entirely "carried" by the liquid, as sound is. What is actually observed is *partial* dragging. Although Fizeau's relation can be derived without resorting to the principle of relativity (Lorentz did so), Einstein considered it an excellent experimental test of Special Relativity. Unfortunately, the denial of multiple causes for observed results (except, of course, for Special Relativity's interpretation) is one of the key factors in current scientific rhetoric.

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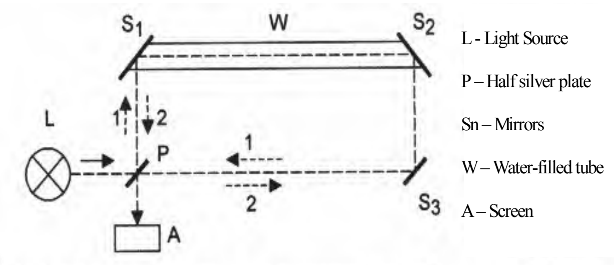
[302] Copyright © Soshichi Uchii

Martinus Hoek 1868

In 1868, Hoek tried to detect the Earth's absolute orbital speed and improved on the accuracy of the Arago experiment. The experiment was similar to Fizeau's, but simpler in concept and easier to explain in the absence of ether.



Hoek Experiment

As shown in the figure above, the Hoek interferometer sent light opposite ways around a closed path, the top part of which included a tube filled with water, which was expected to partially drag the ether. By rotating the apparatus through various angles, and observing the manner in which the interference patterns shift, one can determine the degree to which the ether is constrained by the water due to the motion of the Earth in its orbit.

The fringe pattern did not change at all for any orientation. Each of the rays took the same time to traverse the square circuit. If ***c*** is light's speed in air, c_1 the speed in water, ***n*** the index of refraction = c/c_1, ϕ is the Fresnel drag coefficient, ***d*** the distance S_1S_2 or S_2S_3, time is distance/speed and ***v*** is the water speed:

$$d/(c_1 + \phi - v) + d/(c + v) = d/(c_1 - \phi + v) + d/(c - v)$$

Solving for ϕ to first order in v/c yields Fresnel's relation:

$$\phi = (1 - 1/n^2)\,v$$

Hoek's analysis assumed partial drag of ether. The setup size and time of observation are small, so the Earth's orbital motion is virtually linear and inertial during the experiment. In the experiment's rest frame, no fringe shift is expected, even if the device is rotated. But the orbital speed of 30 km/s should perceptibly drag the ether with the water. If there is no ether to drag, $\phi = 0$, and the etherless solution is obtained, consistent with Special Relativity.

So strong was (and still is) the bias against an immobile Earth that the obvious interpretation of the result is not:

$$\phi = 0 \text{ (zero), but}$$

$$v = 0 \ \geq \phi = (1 - 1/n^2)v = 0$$

where $v = 0$ because the Earth's "orbital" speed is 0 (zero)!

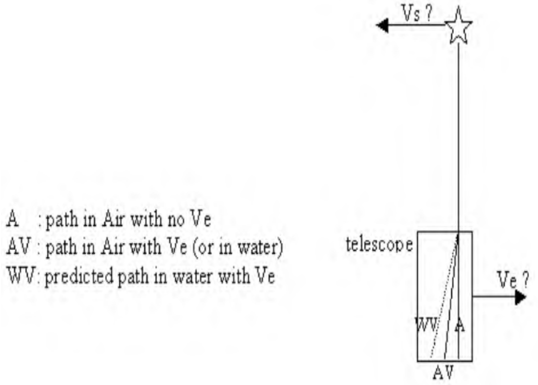
George Airy (1871)

George Airy, 150 years after the Bradley aberration measurements, built a water-telescope to prove the ether theory and measure absolute motion for the Earth. His expectation was to get some change in the effect of astronomical aberration, since water seemed to partially drag/transport a light beam in Fizeau's experiment. Did aberration occur inside the telescope? Did the ether-drag in water change the aberration angle? If ***c*** is less in water than air, would aberration in an air-filled telescope be different than in a water-filled telescope? Would refraction of starlight from air to water be different than normal aberration predicted? None of these things occurred, and a null result meant that aberration was the same for air and water media. This null result is usually explained as ether-drag effects caused by the water. But the experiment showed that the light was deflected by ether ***before*** entering the telescope! Otherwise, it shows that there is no shift in light and the sources are moving in aberrant ellipses!

In actuality, if the Earth was actually moving, the beam should deflect more; if the starlight were moving, there should be no change. Water slowed down the speed of the light inside the telescope, yet Airy found no need to change the telescope angle.

In this sideview of the water telescope, the new path of the aberrated starlight should be *WV*; the result was actually *AV*, the same as the air telescope. Think of the telescope like an empty pipe, tilted so that starlight hits the center of the bottom edge. Adding water will only slow the light down, not change its direction. If the pipe is actually moving while the beam is inside the pipe, slowing down the beam would necessitate tilting the pipe to hit the center bottom edge. Obviously, the starlight was already coming in at the aberration angle, since the water's refraction had no effect. In effect the water's high refractive index made visible the smaller

Fresnel drag of the ether, showing there was no drag of ether or water due to telescope motion. This inferred that the stars were moving relative to a stationary Earth, not that the Earth was moving relative to the 'fixed' stars. When starlight slows down in the water, it still hits the telescope bottom at the same place as in air because its deflection occurred prior to its entry into the telescope. If the telescope were really moving, it would move further sideways while the slower light is inside the telescope, causing a greater deflection than with air.


Vs ?
A : path in Air with no Ve
AV : path in Air with Ve (or in water)
WV: predicted path in water with Ve
telescope
Ve ?
WV
A
AV

Science claims to be logical and rational, while religion is not. The following syllogism demonstrates what the Airy experiment logically concludes.

(a) If the Earth moves, the water telescope will need additional tilting
(b) But the water telescope does not need tilting! (effect is false)
(c) Thus, Earth does not move! (so, cause is false)

This is valid logic: if the effect is not present, neither can the cause be present. For if the cause were present, so would the effect. But supporting the geocentric model is unacceptable to the prevailing modernist ideology. In fact, this experiment was called "Airy's failure," because it contradicted the heliocentric metaphysics. The term "Airy's failure" gives psychological insight to the thoughts of the experimenters during this era. Earth motion with respect to ether was universally expected as the only outcome. Both this experiment and the Michelson–Morley experiment were thought to be dead-ends to understanding reality until Einstein rescued physical theory by ignoring the evidence for Geocentrism and ether, opting instead for Special Relativity, which gave a mathematical solution at the expense of logic.

Summary

Looking at stars, if the Earth is moving, or if the star is moving and the Earth is at rest, the relative motion of the telescope and the light traveling down the telescope would be sideways relative to the telescope. The telescope must be tilted to keep the light from hitting the side. This is familiar to astronomers. It is commonly called *aberration*. When the water-filled telescope reduces ***c*** to 77% of ***c***, only motion of the Earth, not the star, should affect the amount of additional tilt required on the telescope. Airy thought he needed to tilt his water-filled telescope more than the air-filled telescope to see a star. He did not. The starlight was already coming in at the correct angle, so no change was needed. This demonstrated that it was the stars moving relative to a stationary earth and not the fast orbiting Earth moving relative to the comparatively stationary stars. If the telescope were moving, he would have had to change the angle. If the water-filled telescope had to be tilted more than the empty telescope to see the star, it would mean that the Earth was moving (around the sun).

Conclusion: Aberration is independent of the local medium. In fact, Airy's failure was a [unrecognized] geocentric success; the results were consistent with an immobile Earth.

Michelson-Morley (1887)

The Michelson-Morley experiment is a landmark event in the history of physics. A stationary ether had been proposed to support the transmission of light through space. The experiment was intended to verify the motion of the Earth around the sun through the static ether. But it was said to have failed to do so, since the speed of light apparently did not depend on the reference frame in which it was measured.

The interpretation of the results are still actively being discussed, over a century after the fact. And the results of similar experiments since then have led reasonable people to ask of the null result, "But, just how null is null?"

The Michelson-Morley experiment null result was rather astounding and not explainable by the then-current theory of wave propagation in a static ether. Efforts to save the ether theory included ether-drag or entrainment, which would reduce the expected effect from a rigid ether.

The Earth's gravitational field dragged the ether around with it in such a way to eliminate the ether's effect.

Another attempt was the Lorentz-Fitzgerald contraction hypothesis, which claimed that everything contracted in the direction of travel through the ether, without providing any explanatory mechanism or independent empirical proof. It was thought that Michelson-Morley obtained a null result due to this contraction, which neutralized the ether's effect on light. However, the Kennedy-Thorndike experiment in 1932 eliminated Lorentz-Fitzgerald contraction as a viable option.

The interpretation that the medium drags/entrains the ether with only a part of the medium's velocity was questioned after Wilhelm Veltmann demonstrated that the refractive index, n, in Fresnel's formula depended upon the wavelength of light. The ether could not be moving at a speed that depended on wavelength – a dispersive property – if it was required that ether have no dispersion, as some did. In any case, the idea of a simple rigid ether was dealt a serious blow. However, positive results for the presence of ether in various theoretical forms were claimed by Dayton Miller, Sagnac in 1913, and Michelson and Gale in 1925.

A Simple Model

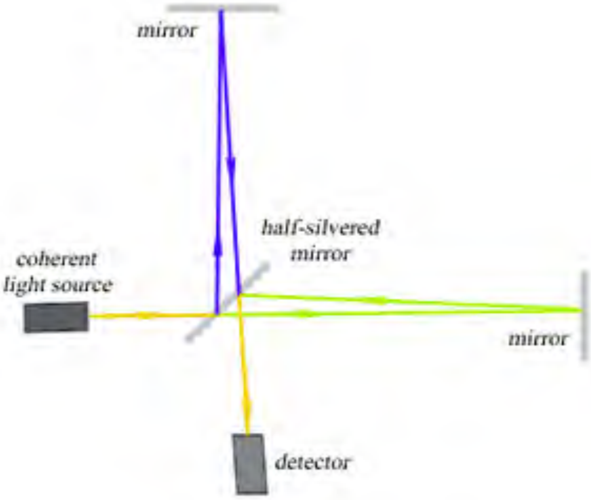
The simplified Michelson-Morley experiment test procedure was equivalent to putting your hand in the water to test for motion of a boat. If the boat is moving through still water, or if there is a current outside a boat tied up at a dock, you will feel the water flow. If the speed of the boat is $\boldsymbol{v}_{\mathbf{b}}$ in a lake, then in a river with current $\boldsymbol{v}_{\mathbf{r}}$ the boat's speed will increase by $\boldsymbol{v}_{\mathbf{r}}$ headed downstream and decrease by $\boldsymbol{v}_{\mathbf{r}}$ headed upstream:

$$V_{\mathrm{up}} = v_{\mathrm{r}} - v_{\mathrm{b}}$$
$$V_{\mathrm{down}} = v_{\mathrm{r}} + v_{\mathrm{b}}$$

This is the Galilean velocity transformation of simple addition/subtraction of relative velocities. Heading directly across the river will cause the boat's actual motion to drift downstream, due to the push of the water flow. Using this boat-water model, Michelson and Morley sought to measure the difference in length (and time) in the analogous motion of light (the boat) through different directions of the ether wind (water current). As they understood it, with the apparatus fixed to the Earth as it orbits the sun, the direction of the equipment would change direction through the ether every six months.

Description:

Shielding of the apparatus by this interior location and a short light-path diminished the effect of the ether, as Dayton Miller showed. A small but practically “null” result was virtually guaranteed by using this experiment protocol. The apparatus was located in a closed room in the basement of a stone building, isolated from thermal and vibrational effects. Building the apparatus on top of a huge block of marble, floating in a pool of mercury, reduced vibrations further. The sensitivity was about 1/100th (0.01) of a fringe. Each full rotation of the device in the mercury pool made each arm parallel to the ether wind twice and perpendicular twice, yielding a sine wave output. If the wind were solely from the Earth’s solar orbit, the wind would fully change E-W directions during a 12-hour period. The yearly cycles would be seen as a change in wind speed.



Interferometer schematic[303]

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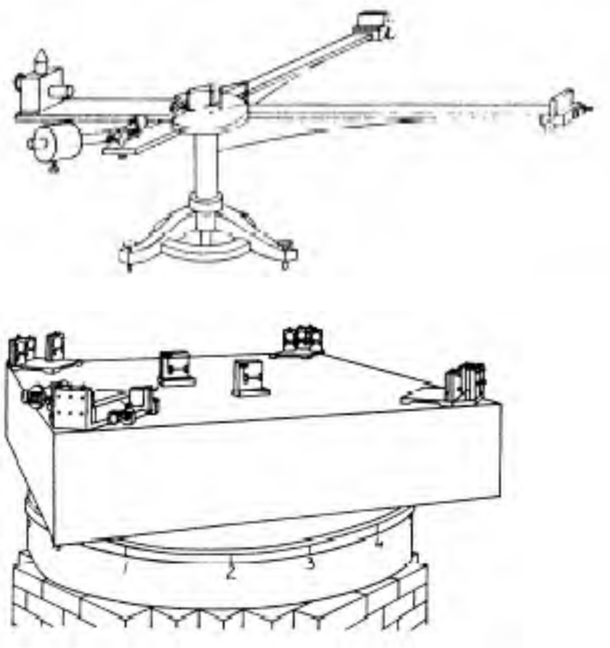
[303] http://upload.wikimedia.org/wikipedia/en/thumb/d/d7 /Interferometer.png/ 300px-Interferometer.png (Licensed under GNU 1.2).



Interferometer layout[304]

Michelson interferometer[305]

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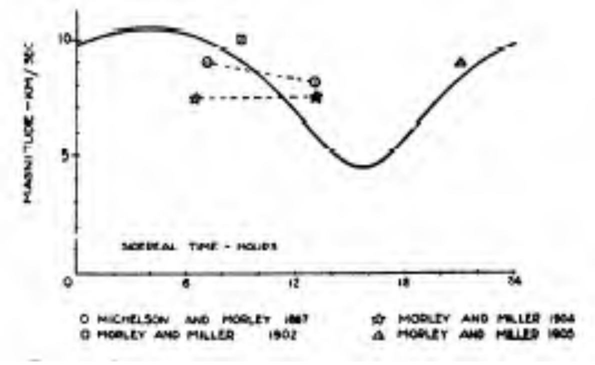
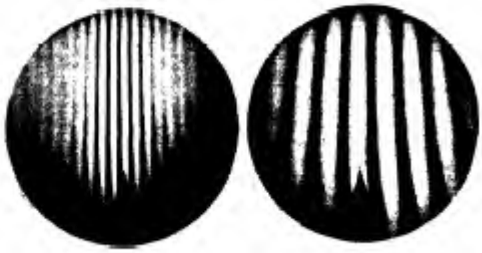
[304] The Ether-Drift Experiments and the Determination of the Absolute Motion of the Earth, Dayton Miller, (Reviews of Modern Physics 5, 203-242 (1933)).
[305] *Ibid*.



Comparison of ether drift velocity: Michelson/Morley/Miller[306]



Interference fringes as seen in the interferometer[307]

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[306] *Ibid*.
[307] *Ibid*.

Open air experiment at Mt. Wilson[308]

A light beam is directed at an angle of 45 degrees at a half-silvered, half transparent mirror A. The split beams reflect off mirrors C, D back to the half-silvered mirror, are merged at A so a telescope at O views the 2 overlapping quarter-intensity beams together. If there really is an ether wind affecting the light, the overlapping beams should arrive at slightly different times, since their path lengths are different. One path was up and down the ether stream, the other across it. Rotating the whole apparatus in various directions on a turntable would find the maximum effect, corresponding to being aligned with the ether stream. This would also eliminate systematic errors in the path lengths.

The interferometer can be calibrated by moving mirror D a small distance d. The change in distance can then be measured by counting m, the number of bright fringes in the intensity pattern. The difference in path length is $2d$ and the wavelength of the monochromatic light is λ. For the maximum fringe signal detected,

$$2d = m\lambda$$

The optical path length between the mirrors also depends on the refractive index $\boldsymbol{n}$ along the path. If $\boldsymbol{n}$ and $\boldsymbol{p}$ are the atmospheric index of refraction and pressure and $\boldsymbol{\Delta p}$ the change in pressure along the path from the initial pressure to its current value:

$$m = (n - 1) \text{ x } (2\, d/\lambda)\cdot\, (\Delta p/p)$$

so

$$2d = m\lambda p\square\Delta p/(n - 1)$$

For gases with indices of refraction very close to one, the denominator will be very small, and the fraction very large. This refractive correction was not used by Michelson-Morley and wasn't even realized until a few years ago (see Cahill). The small fringe shift measured must be multiplied by the large refractive correction, making the ether drift hundreds of kilometers per second, in agreement with Cosmic Microwave Background dipole observations and other modern versions of the Michelson-Morley experiment.

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[308] *Ibid.*

Analysis:

If the interferometer is at rest, or there is no relative motion of Earth through the ether, then the travel time t for both arms will be twice the distance L between mirrors divided by the speed of light c.

$$t = 2L/c$$

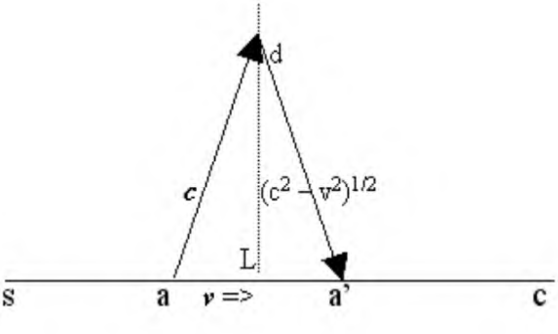
If there is a relative velocity $\boldsymbol{v}$ then the apparatus will move while the light is in transit between mirrors, as seen below. There will now be a difference between the time to cross the ether and the time to go back and forth along it. If the light is moving upstream in the ether, then it should take longer than to go the same distance downstream. For the path along the ether flow:

- with the ether: speed = $\boldsymbol{c} + v$
- against the ether: speed = $\boldsymbol{c} - v$
- time t' to return to the beam splitter

$$t' = L/(c - v) + L/(c - v) = L\,[(c - v) + (c + v)]/(c^2 - v^2)$$

$$= 2Lc/(c^2 - v^2) = (2L/c)\,/(1 - v^2/c^2) \sim (2\,L/c)(1 + v^2/c^2)$$

For the path across the ether flow:



The beam path with an ether cross wind

The speed of the light beam along L is found from the Pythagorean theorem:

$$c'' = (c^2 - v^2)^{1/2} = c(1 - v^2/c^2)^{1/2}$$

The time to traverse ada′ is:

$$t'' = 2L/v = (2L/c)(1 - v^2/c^2)^{1/2} \approx (2L/c)\,(1 + v^2/2c^2)$$

Then the travel time difference between the two paths seen at the interferometer is:

$$\Delta t = t' - t'' = (2L/c)(1 + v^2/c^2) - (2L/c)\,(1 + v^2/2c^2) = Lv^2/c^3$$

If $\Delta t = 0$

constructive interference will form a bright spot. If $\Delta t = \lambda/2$ = half a wavelength, a dark spot will form by destructive interference. In general the number of complete periods, *N*, by which the two waves interfere, is:

$$N = \Delta t/T = Lv^2/(Tc^3)$$

The period of the monochromatic light wave is the inverse of the frequency: $T = f^{-1}$. Michelson rotated the device 90° to interchange the path lengths and double the fringe shift for the total path difference between the two rotated perpendicular axes. This is the distance difference traveled by light between the parallel and transverse ether direction for a 90° interferometer rotation:

$$\Delta N = 2Lv^2/(Tc^3)$$

Results

Michelson-Morley expected to see a difference in the interference patterns for the two perpendicular orientations of the interferometer, showing that light traveled at different speeds in different directions. Assuming heliocentrism, and a rigid ether at rest, a shift of 0.4 fringe was expected for the Earth's orbital speed of 30 km/s = 1/10,000 of ***c***. Fringe shifts should be observable if ΔN is around 0.01 – 0.02 fringe. They found that the fringe shift was much less than expected, < 0.01, but not quite null. Later experiments measured larger effects.

So no ether wind was detected (In the analogous model above: no water flow felt on the hand). Instead of discovering the properties of the ether, the Michelson-Morley experiment found one-fourtieth of the expected fringe effect and one-sixth of the expected velocity. With the exception of Dayton Miller, future Michelson-Morley type results returned what is considered a “null” result. Lorentz recognized that the Miller results, whatever their cause, did not quite tally with versions of Special Relativity. Einstein concluded that the results should be dismissed as experimental error. As interpreted since, the Michelson-Morley experiment is considered to be the first strong evidence against the theory of a luminiferous ether. This opened the door to the wild mathematical speculation divorced from experimental proof so rife in theoretical physics today.

Experimental Errors

The Michelson-Morley type experiments that followed showed a small positive velocity, too small to show the presence of ether wind, sometimes within the error limits, sometimes not, but never exactly zero. The original Michelson-Morley experiment showed a small consistent ether wind – never exactly zero – but well within the devices’ capability to detect. But then preconceptions twisted the reported results. Miller outlines how Michelson-Morley actually averaged the day and night readings in 1904 when the results were published! What happens when you average two sine waves that are perfectly out of step? Miller also argued that there was little possibility of detecting an ether wind since it was almost completely blocked out by the laboratory walls or by the apparatus itself. He realized that if matter, or a magnetic field, had any interaction with a fluid-like ether, there would be an entrainment effect, ruling out a basement lab site.

Many questions have been raised even to this day about the experimental protocol and what exactly Michelson-Morley were measuring. The results of many similar Michelson-Morley type experiments shows the measurements are never zero, but average about 3% of the expected values. The post Michelson-Morley experiments, especially the meticulous work of Dayton Miller, supported the geocentric origin of this small but persistent non-null result.

Theoretical Errors

Michelson-Morley found a “null result,” a term much abused and misused. It doesn’t mean no motion was detected, but only that the measured result could not confirm the hypothesis of an ether, at the precision used in the experiment. In other words there was a lack of proof, not a disproof, of the existence of ether. The null result was unexpected, even though the effects were: (a) not measuring OWLS – one way light speed – but TWLS – two way light speed, as the difference between the two trips, and (b) the effect was of second order in *v*/*c*.

Michelson-Morley experiments have only been performed in terrestrial laboratories, where the gravitational field and the magnetosphere of the Earth and other ambient factors are always present. A repetition in space will remove these local features and allow a universal conclusion. This is also true of similar experiments dependent on ether motion or density. Many exotic experiments have been conducted in space, but those that might test Einstein's postulates have never been done, yet. (NB: A positive result from the current test of General Relativity theory, called Gravity Probe B, will not only support frame dragging, but also many ether theories.)

Modern Interpretation

Science was at a crossroads. Either Geocentrism was to be accepted as true or a new anti-geocentric paradigm had to be introduced to replace Heliocentrism. The impasse was broken with Special Relativity theory, which opted for the following:

- ***c*** is constant
- no preferred reference systems, like Heliocentrism or Geocentrism.
- All motion is relative.
- no need for ether
- Lorentz contraction of lengths
- clocks run slow.

The development of Special Relativity derived the Fitzgerald-Lorentz contraction from the invariance postulate, and was also consistent with the apparent null results of most experiments (although not with Miller's long-term seasonal effects). Today Relativity is generally considered the solution to the Michelson-Morley null result. Ritz's emitter or ballistic theory was also consistent with the results of the experiment, also not requiring ether, but it predicted wild gyrations of binary star light due to arrival time differences as they orbit each other. Interferometer observations of normal behavior seemed to rule out the ballistic theory, until it was rescued by the extinction model.

Four possible explanations were offered, three by Michelson, to explain the null Michelson-Morley outcome:

1. The Earth is fixed in the ether: Although obvious, Michelson still excluded this from his list of possible options! This is clear

evidence of the anti-geocentric mindset of science at this time. Heliocentrism had been promoted as true since Galileo's time but still had not been logically proven. The evidence points to Geocentrism, but modern science denies it, and keeps denying it, no matter what the evidence placed before them.

2. There was no ether drag, as the ether was forced to move with the Earth. There were at least two strong problems with this option:

    a. conflicts with other drag experiments.
    b. A big consistency problem: the Airy failure had been resolved with a dragging effect through the ether!

3. Light speed was constant with respect to the source

    a. There were at least one strong problem with this option: conflicts with other experiments on the properties of light.

4. An *ad-hoc* offering: distances shrink (Lorentz contraction) along the motion's direction. This also presented problems:

    a. There was no other independent evidence for this alleged contraction
    b. It must be universal for all types of material, air, water, steel, etc.
    c. No underlying mechanism to explain or implement it was proposed.
    d. Contradicts the Sagnac effect, which shows no shrinkage of lengths.

Geocentrism's Response

The anti-geocentrism posture was probably never more evident than in Michelson's strained effort to avoid concluding the Michelson-Morley experiment showed the Earth at rest, including a shrinking of size in the moving frame! But this was a conclusion that a child could have reached. The 'null' result left the heliocentric folks in a real bind.

- If there's no ether, then there's no Fresnel drag to explain away Airy's failure, and Geocentrism becomes the logical choice.

- If there is a fixed and absolute ether, the experiment should detect the relative motion of the Earth around the sun through it, but no proof of orbital motion was found!

The obvious conclusion was that no motion was detected because the Earth is fixed! Note that we cannot suppose in advance anything about the motion of the Earth. At Galileo's time, for example, experiments like Michelson-Morley's would prove that the Earth was stationary, since that was the dominant worldview. Today, Geocentrism is always the simple option overlooked.

Summary

Some say the Michelson-Morley experiment is the keystone on which the second postulate of Special Relativity is based. This null result is the basis for justifying time dilation and the host of other paradoxical properties of relativity. Most say the result was within the error of the mechanism but this is not true in Dayton Miller's experiments or in the light of all the modern evidence since. The Miller and Michelson-Morley type experiments had very significant and reproducible non-null results.

One of the apocryphal aspects of the Michelson-Morley experiment is the fact that the readings plotted out to a sinusoidal wave with a single rotation periodic effect, exactly as expected of the ether wind. Moreover, the wave's phase was exactly opposite at night, as expected for a reading on the other side of the Earth.

Even with questionable construction, location and extremely low precision, there was definite proof of ether's existence all the way back in 1887, with only 6 hours of observations!

Conclusions

Ruling out the existence of ether from either the Michelson-Morley or Miller experiments seems to be illogical in the extreme. Almost all other Michelson-Morley type experiments are performed in some sort of metal container in basements and other obstructive situations. Using the concept of entrainment totally invalidates all of their subsequent results.

The ether theory virtually died with the acceptance of Special Relativity. Einstein said that the Galilean transformation was only a low velocity approximation to the truth. By applying the Lorentz transformation to all inertial reference frames, he alleged that not only physics laws remained covariant but also ***c*** was invariant. The null results were now expected and the usefulness of the single universal ether frame vanished. Now location in space or time was not absolute, but depended on the observer's location and speed.

As for the ether, having no proof of existence is not the same as a proof of non-existence. Of the many paradoxes of Relativity, one relates directly to the ether. Einstein simultaneously proposed that in Special Relativity there is no ether, yet in General Relativity space is curved yet empty! Although Special Relativity theory ignores ether, General Relativity theory does not, but uses "curvature of spacetime" as a euphemism for a space that affects matter. For example, look at one model of "spacetime" filled with a structure called the "spin foam." Similar to ether, the foam uses a privileged reference frame and thus is not Lorentz invariant, but which is a required symmetry of Special Relativity. It disagrees with the Michelson-Morley experiment. Yet this is a credible modern theory, having the blessing of General Relativity theory to forgive its clash with logical consistency.

Modernists claim that ether makes it much harder to remain consistent with all of the relevant modern experiments in physics. This premise hangs on rejecting an immobile Earth, a possible causative agent in ALL experiments investigated so far. Modern science dismisses many conflicts and inconsistencies with the mantra, "out of sight, out of mind." Contrary evidence to the relativity theory paradigm is treated not as a challenge, but with contempt. Scientific ignorance is bliss. Fortunately, some objective physicists are only now realizing, from other astronomical evidence, that a viable possibility to explain the Michelson-Morley experiment is that the Earth is stationary, the focus of the whole universe. Yes, the dreaded word - geocentrism.

Oliver Lodge (1892)

Aberration and ether drag:

A uniform ether flow causes no aberration, which only depends on observer motion, according to Bradley. Ether drift has no effect on terrestrial surveying results. Although the ether drifts, it must be uniform everywhere, with no boundary between ether in two different states of motion. At such a boundary the light beam would change direction and appear to lag behind the true position, in proportion to the boundary-ether difference, as compared to a light beam not crossing the boundary. Such a negative aberration has not been seen.

If matter has no interaction at all with a frictionless inviscid ether (*i.e.*, no ether drag), then aberration will not occur. The persistent motion of the Earth or planets over time through a viscous ether shows that any ethereal viscosity, if it exists, is beyond detection now. Energy lost to the ether would slow planetary motions down, is not observed.

Interference and refraction experiments were performed by Fizeau, Hoek, Jasmine, Mascart, Maxwell, Fresnel, Arago and Airy. None of the results implied an ether stream moving over the Earth's surface. The theory of astronomical aberration would be hopelessly complex if ether were dragged across the starlight before entering or inside the telescope.

Lodge's experiment:

If ether does not drag matter with it, is the reverse possible - that matter drags ether? Will a substantial mass disturb the ether? Lodge used large steel disks spaced apart and mounted on a rotating platform, with four mirrors positioned as in the Sagnac experiment to produce interference effects between counter-moving light beams. The difference was the large spinning frame that supported the mirrors. Lodge supposed the steel mass would drag the ether enough to be detectable. His first attempt showed a substantial fringe shift, thought to prove the existence of "matter drag" of the ether. But when the rotation sense was reversed, the fringes shifted in the original direction – the fringe shift was due to the change in air density and refractive index n due to the motion of the steel plates! Lodge also used charged plates to produce an electric field in the gap containing the light beam, and also iron magnets instead of steel. Still no fringes were noted when the spurious shift due to the change in refraction properties of air was eliminated (with much difficulty). The result was summarized as:

> the velocity of light between two steel plates moving together in their own plane an inch apart is not increased or diminished by so much as 1/900 (0.0011) part of their velocity.

Result:

Oliver Lodge performed experiments on the propagation of light near rapidly moving steel disks to test Stokes hypothesis that moving matter drags the ether with it. No such effect is observed.

Trouton-Noble (1903)

The experiment was based on a suggestion by George FitzGerald that a charged parallel-plate capacitor moving through the ether should orient itself perpendicular to the motion, by experiencing an impulse when it is charged or discharged. Like the earlier Michelson-Morley experiment, Trouton and Noble obtained a null result: no motion relative to the ether could be detected. Trouton suggested that a turning force couple on a carefully insulated charged condenser moving through the ether might be detectable. This also produced a null result.

This null result was repeated in experiments by Chase in 1927 and Hayden in 1994. Such experimental results are now thought to be consistent with Special Relativity, to reflect the constancy of the speed of light and the absence of any absolute rest frame (or ether).

Experiment details:

In the experiment, a parallel-plate capacitor is charged and suspended by a fine torsion fiber. If the ether theory were correct, the change in Maxwell's equations due to the Earth's motion through the ether would lead to a torque causing the plates to align perpendicular to the motion. The electromagnetic energy of the condenser will have its lowest value if the plates are perpendicular to the direction of motion. Trouton concluded that the turning couple will try to put the plates at right angles with impetus from the velocity of the ether. The charged condenser moves through the ether with a velocity in the X-direction with its plates parallel to the direction of motion. If the plates are oppositely charged and edge effects are ignored, there will be a constant electromagnetic field between the condenser plates, and no field outside. When a condenser is at rest in the ether, there is only an electric field.

When moving through the ether, there will also be a magnetic field. The electric field **E** points across the plates; the magnetic field **B** caused by the charge motion is perpendicular to both **E** and **v**. There would be no **B**-field if the condenser were moving with plates perpendicular to the velocity. The energy to create the magnetic field was thought to come from a decrease in the kinetic energy of the condenser, which would be detected as a decrease in speed.

Trouton tried to get the torsion balance to oscillate in its resonance frequency by charging and discharging the condensers at intervals corresponding to the free period of swing of the apparatus. He did not find any effect. But Special Relativity says that Maxwell's equations are invariant for all frames of reference moving at constant velocities, so no torque is predicted (a null result). The experiment is very difficult to control – small effects due to external electric and magnetic fields make it difficult to separate a positive from a null result.

Geocentrism's Response: Only light and gases show ether effects; the experiment was incapable of achieving ether detection unless a charged gas is used between the plates.

Trouton-Rankine (1908)

Fitzgerald and Lorentz had independently proposed a contraction to explain the null result of the Michelson Morley experiment. Lorentz showed that this hypothesis, along with proper time, made Maxwell's equations and the Lorentz force law invariant in a moving frame, in agreement with Special Relativity.

In Special Relativity, the Lorentz-Fitzgerald contraction is not detectable in a co-moving frame. Trouton and Rankine saw that a contraction of the object in the moving frame should be measurable in the object's rest frame. To measure this effect was the experiment's purpose.

Because the Lorentz-Fitzgerald contraction is only in the direction of motion, from the point of view of the absolute ether frame the length of the resistance coils depended on their angle with respect to their ether velocity/drift. The resistance in the rest frame should change as the device was rotated. However careful measurements showed no change in resistance.

In 1908, Trouton and Rankine measured the change of resistance of a wire when oriented from parallel to transverse to the ether drift. They used a Wheatstone network for precise resistance determination. A Wheatstone bridge is a clever measuring setup used to measure an unknown resistance by balancing two legs of a network circuit. The bridge was balanced when the wire in two of the coils was at right angles to the ether drift and then the whole assembly was rotated through 90 degrees and the change of balance was tested. Every conceivable precaution was taken, but still there was only a negative result.

After rotating the bridge by 90^0, Trouton and Rankine calculated the equivalent resistance by taking into consideration the Fitzgerald contraction. If the Fitzgerald contraction existed, since the resistance is directly proportional with the length, Trouton expected to see a change in resistance given by the derivation that follows.

Analysis:

The resistance of an elliptical wire of length l, resistivity ρ, area S and axes a, b is:

$$R = \rho l/S = \rho l/\pi ab$$

For motion along the wire axis the length l contracts according to Lorentz to become:

$$l' = l/\gamma \qquad a' = a\gamma$$

so l contracts, a expands and b is unchanged, because it's perpendicular to the motion. The equilibrium resistance:

$$R' = \rho l/\gamma\pi a\gamma b = R/\gamma^2$$

For motion along the elliptical axis a:

$$l' = l\gamma \quad a' = a/\gamma$$

At 90 degrees the resistance is:

$$R'' = \rho l\gamma/\pi(a/\gamma)b = R\gamma^2$$

The change in resistance due to rotation in the ether wind causing Lorentz contraction is:

$$\Delta R$$

$$= R(\gamma^2 - 1/\gamma^2)$$

$$= R[1/(1\text{-}v^2/c^2) - (1\text{-}v^2/c^2)] \sim R[\,1 + v^2/c^2 - (1 - v^2/c^2)]$$

$$\Delta R \sim 2Rv^2/c^2$$

This resistance change can be precisely measured with the Wheatstone bridge setup. After rotating the balanced bridge by 90^0, the bridge should become unbalanced by an amount ΔR. Trouton and Rankine observed a near-zero deflection, *i.e.* a deflection several orders of magnitude smaller than predicted by theory. This experiment marked the end of the Lorentz-Fitzgerald contraction theory. The experiment has been re-enacted several times with the same results and higher precision.

Conclusion:

This test showed that, if the Lorentz-Fitzgerald contraction existed, it was not measureable in the rest frame of the object. This experiment has been re-enacted several times by Chase and Tomaschek at a higher precision with the same results.

Kennedy-Thorndike (1932)

Kennedy-Thorndike specifically tests whether **c**, the speed of light, depends on the velocity of the laboratory. Special Relativity states that the speed of light is the same no matter how fast an observer is traveling. The experiment monitors the oscillations of a light source as it accelerates and decelerates from the combined motions of rotation and orbital revolution. By making one arm of the experiment much shorter than the other, a change in speed of the Earth would cause changes in the travel times of the light rays, from which a fringe shift would result unless the frequency changed by the same amount. One arm was very long and placed north-south. Opposite ends of the experiment were thus at different rotation velocities due to their slightly different latitudes, so the length contraction would not cancel out for east-west motion. As no significant fringe shift was found, the experimenters concluded that time dilation occurs as predicted by Special relativity: “the conclusion to be drawn is that the frequency of a spectral line varies in the way required by relativity.” Without the time dilation, the Lorentz contraction hypothesis is unable to explain the null result from this experiment.

Special techniques:

Several unique protocols were used in this experiment:

- The apparatus was kept at temperature constant to 0.001° C over several seasons.
- Fringes were photographed.
- It used a fixed laboratory to look for diurnal and seasonal variations as it moves along with the Earth’s spin and orbital motion.
- Its mirrors were modified to include a half-wave “step,” eliminating the possibility of a standing wave pattern within the apparatus.
- It had precision of 1/1500 fringe or ¼ degree in phase angle
- It employed the first actual vacuum interferometer
- a null result implies the estimated ether drift was $v <$ 24 km/sec.

An entrained ether was discounted by the experimenters:

> In view of relative velocities amounting to thousands of kilometers per second known to exist among the nebulae, this can scarcely be regarded as other than a clear null result.

This statement serves to illustrate how deeply ingrained were both the Big Bang model and the concept of a static ether.

Hamar (1935)

Instead of passing through a static and unmoving ether, massive objects at the Earth's surface may drag some of the ether along with them, making it impossible to detect an ether wind. Hamar intended to cause an asymmetry in any proposed ether wind. If there was any ether wind at all to be detected, the leg of the interferometer with containing lead should have experienced less ether wind than the other leg. Hamar's expectation of the results was that:

a) In an experiment without lead blocks, both arms would be equally affected by ether entrainment.
b) In an experiment with lead blocks in place on one arm, only one arm would be affected by ether entrainment.

The reported result concluded, even with the lead blocks in place, the fringe displacements were equal to the ones without any lead blocks. This was presented as proof against the ether-drag hypothesis.

Interpretation:

Because differing ideas of "ether drag" existed, the meaning of the experiment depends on each version of the hypothesis. There are two main levels of drag that have been proposed:

(a) Partial entrainment by any object with mass, as taught by Fresnel and Arago.
(b) Partial entrainment at larger, perhaps even global magnetic field level, as believed by Michelson and Miller.

Frisch-Smith (1962)

This was a demonstration of time dilation carried out by Frisch and Smith in 1962. Because a mechanical clock could not be accelerated to a speed close to the speed of light, they chose to observe the decay rates of *mu* mesons (muons), *i.e.*, cosmic-ray fragments.

Cosmic rays carry extremely high energies into Earth's atmosphere from beyond the solar system. When a ray strikes an atom in the atmosphere, it creates a cascade/shower of high-speed particles, including muons. Once a muon is created, its lifetime is a statistical variant, depending on its probability of decay, expressed as a half-life. Muons have a half-life of 1.523 millionths of a second. In each half-life, half of the remaining muons decay to other particles. Reasoning in reverse, if the number of muons created is known, and then the number at some later instant is counted, then elapsed time in the muons' inertial frame can be computed.

Frisch and Smith set up their apparatus on Mount Washington in New Hampshire at 6265 feet above sea level, where they detected an average of 563 muon decays per hour. The flight to sea level takes 6.3918 microseconds, which spans 4.197 consecutive muon half-lives. If time in the muons' frame were not dilated relative to the lab frame, then that flux of muons would drop from 563 per hour on Mount Washington to about 31 per hour at sea level. If the muons' time is dilated, then the Lorentz factor for a relative speed of 99.52% of light speed equals 10.22, which expands the muon half-life to 15.565 microseconds. The muon flow would shrink at sea level to 423 per hour. Data was then collected at 10 feet above sea level. At this location muons were measured at an average rate of 408 per hour vs. the theoretical rate of 423/hr.

Conclusion: Since the muons are travelling nearly the speed of light, their internal clock is slowed by the amount accounted for by Einstein's special relativity so that more reach sea level than otherwise expected. Muons generated in cosmic-ray showers decay in dilated time.

Geocentrism Analysis:

- In all inductive (empirical) proofs, the understanding is that positive examples only support a theory. Only a deductive proof from an outside body of knowledge – like theology – can assert the truth. Time dilation supports but does not prove Special Relativity.
- Special Relativity is not applied correctly in the standard analysis above. The focus is on time dilation, but Lorentz transformation symmetry requires a corresponding length contraction in the other frame, and Lorentz contraction is simply ignored. The two known values are in different reference frames: the half-life is known in the meson rest frame; the altitude at which decay occurs is known

in the ground rest frame. For the speed of mesons the gamma factor is 10.22, so the contracted altitude is 613 ft in the meson's frame – see table below.

Frame	Half life	Average range
Meson	1.523 usec	613 ft
		⇩ ⇧
Ground	15.565 usec	6265 ft

The claim that the meson will not reach the ground is empty, if the Lorentz contraction of altitude is considered. The ground is only 613 ft away! So the mesons will reach the ground at the rate observed, whether seen from the meson view or from the ground. There is no paradox. But it is expedient to ignore this, in order to focus on the time dilation alone.

- Other experiments show Lorentz contraction doesn't exist. The argument above is thus moot, but important in deconstructing the Special Relativity argument favoring time dilation.

DePalma Spinning Ball Drop

A ball spinning at 27,000 RPM and a non-spinning ball were catapulted side-by-side with equal momentum and projection angle. In defiance of all who reject the ether as realistic, the spinning ball actually weighed less, and traveled higher than its non-spinning counterpart. Those who attribute this to an aerodynamic or atmospheric effect, please note that it works just as well in a vacuum. Also note, this effect has since been verified by other [enlightened] researchers.

The decrease in weight of the spinning ball – anti-gravity – can explain why the spinning object goes higher and falls faster than the identical non-rotating control. Current thinking is that there is no special interaction between rotation and gravity. The behavior of rotating objects is simply the addition of ether energy to whatever motion the rotating object is making.

Is this a harnessing of torsional ether waves by rotation? Both balls draw energy into themselves from an unseen source, but the rotating ball absorbs more of this ethereal energy than its counterpart – energy that would be manifest as gravity, moving down into the Earth. With a decrease in torsional ether above the ball, there is a slight decrease in gravity, the ball gets slightly lighter. Needless to say, this effect defies standard theories.

Gyro Drop

A fully enclosed, electrically driven gyroscope is released to fall freely under the influence of gravity. The elapsed time taken to fall a measured distance was photo-timed, with the rotor stopped and then spinning. The gyroscope fell along its axis. Power leads for the rotor were disconnected just prior to release.

With 97% statistical confidence, the difference in the fall rate for the spinning and static balls is not due to chance.

	Static	**Rotating**
Acceleration (ft/s^2)	32.1549	32.2619
Delta acceleration	.1070	
Equivalent force difference	.38oz / 7.23lbs = 0.33% weight loss	

Quantum Red Shifts, Tifft (1984)

William Tifft noticed a curious relationship between a galaxy's shape (Hubble type), brightness, and red shift. Coma Cluster galaxies configured themselves along sloping bands in a red shift vs. brightness diagram. Several well-studied galaxies, including M51 and NGC 2903, exhibited velocity breaks, or discontinuities, or jumps – like steps on a stairway – at their nuclei which tended to be around 72 kilometers per second, independent of galaxy selected. Later on, smaller velocity jumps inferred from the red shift breaks were found: 1/2, 1/3, or 1/6 of the original 72 km/s value. The formal confidence levels associated with these quantum results are extremely high.

Tifft's initial suggestion was that galaxy red shifts take on preferred or "quantized" values. Were red shifts analogous to atomic energy levels, a repetition in the macro world of features in the micro world? Why wasn't this obvious pattern noted before? Two reasons: (a) Precision was insufficient, (b) If the pattern was not expected, there's no reason to test for it.

Further evidence was needed. Binary galaxies physically correlated with one another can test for red shift quantization. The red shifts from their mutual orbital motion should be a smooth curve; there should be no jumps. But disparate analyses find the red shift differences between galaxy pairs are quantized rather than a continuum, discrete rather than analog. They cluster near multiples and factors of 72 km/s. Visible-light spectra was used first, but was not sufficiently precise for confidence. A 1980 radio survey of binary galaxies made in the 21-cm emission of neutral hydrogen provided the assurance of precision. Red shift quanta were grouped around 72, 144 and 216 km per second, a very unlikely coincidence. It now seemed that wherever the effect was sought, it was found. Statistical experiments over the entire sky, rather than galaxy pairs, were needed, but are much more difficult to carry out.

Dwarf irregular galaxies spread across the sky were next selected for surveying and statistical analysis. The dwarfs displayed an extraordinary clumping of red shifts into discrete bins of 24 km/s, 1/3 of the original 72 km/s interval. The likelihood that such clumping would randomly occur is just a few parts in 100,000, $< 10^{-4}$.

Next, galaxies in the Fisher-Tully catalogue that showed large amounts of rotation and interval motion (the opposite extreme from the dwarf irregulars) were studied. The galaxies' red shifts again were discrete, but this time hovered around 36 km/s, 1/2 of the basic 72 km/s spacing. The inescapable conclusion was that at least some galaxy types all over the sky have quantized red shifts that are simple fractions of 72 km/s.

Astronomers have now confirmed that numerical values of galaxy red shifts are 'quantized' into distinct levels. Hubble's law treats red shifts as proportional to the galaxy distances, so the distances also fall into groups of concentric spherical shells around us. Since the shells are about a million light years apart, our distance from the center must be much less than that, to avoid visual mixing. The probability of this occurring by chance is incalculable.

$$\Delta\lambda/\lambda \;\square\!= \mathrm{Hr}/c$$

H is the Hubble constant, empirically derived, with wide interpretative range. Its current value is 75 km/s per Mpc (Megaparsec). This is the famous Hubble law, which says that red shifts tend to increase in proportion to distance. Hubble and Slipher said the wavelength shifts were Doppler shifts, produced entirely by the relative velocity v of the source and Earth. For non-relativistic speeds, the wavelength shift given by the Doppler formula is:

$$\Delta\lambda/\lambda \sim v/c$$

which implies that

$$v \sim Hr$$

In models of Einstein's theory of General Relativity that include an expanding space, such as the Big Bang, light from distant stars would stretch more than from nearby objects, so Big Bang red shifts would increase with distance. Theoretical physicists (cosmologists) hold that the Hubble relation represents a Big Bang expansion red shift of all space, not a Doppler shift. The additional proper motion of the star is a Doppler shift. But experimental physicists (astronomers) choose to describe red shifts with velocities equivalent to a Doppler shift, with a single value, not two. This practice has long confused the public, the media, and even the astronomical community into thinking of the red shifts as being caused only by velocities of the objects. The persistence and prevalence of this confusion is not hard to fathom, since it can be reinforced by emphasis in standard textbooks and press releases. The distinction is rarely made. It does benefit, however, those who need flexible interpretation of red shift data to prove or disprove a specific issue. Perhaps Relativity theory refers to the relativity of interpretation.

In summary, then, galaxy red shifts are approximately proportional to velocity and distance as expressed quantitatively in the Hubble law. Ground telescopes show quantization at least out to medium distances, of the order of 100 million light years. The Hubble Space Telescope shows similar clustering of red shifts out to distances of billions of light years. In 1996, Tifft showed that Milky Way motion in the cosmic microwave background (CMB) frame must be compensated for: 560 km/s in a direction south of the constellation Hydra. In this Cosmic Microwave Background rest frame, red shift groups have much greater definition. Smaller levels like 2.6, 9.15, and 18.3 km/s become evident. Validity of the data is no longer questioned, but an explanatory theory has not been found – in modernist physics, that is.

Why do the red shifts of particular types of astronomical objects only take on certain values, suggesting that the objects are on shells concentric around the Earth, implying the location of the Earth is special? No modern cosmology models explains this periodic grouping of galaxy red shifts around discrete values across the span of the universe. This is no minor anomaly.

Claims and Responses

Claim #1: The universe is a huge spherical resonant cavity, tuned to the Cosmic Microwave Background wavelength, with nodes in between galaxies, which are the maximum of the Cosmic Microwave Background standing waves.

Response: Then why are there not resonances in the ether flow?

Claim #2: If the Doppler shift is rejected, the accepted interpretation of the red shift, then the distance to galaxies is unknown, because the Hubble Law is invalid. If the red shift is entirely or partially non-Doppler and not due to cosmic expansion, then it could be an intrinsic galactic property, such as mass or luminosity. Each galaxy may have a state specific to itself, like the characteristics of individual humans. Relatively little blurring in the quantization means any real motions must be small compared to the internal state. Galaxies would have little relative motion, sitting static in the universe instead of expanding.

Response: It is rejected because the main pillar of the Big Bang is the Hubble red shift, proportioned to distance and recessional velocity. This crisis cannot be permitted.

Claim #3: Gravitation creates clusters of galaxies with similar red shifts.

Response: But then the clusters should be independent, not coordinated across the visible universe.

Claim #4: A quantum red shift operator theoretically will create discrete eigenvalues of a wave equation.

Response: But if it is a wave equation, what is waving? If a quantum operator, why a cosmic scale, when quantum mechanics has always applied to the microworld. And what is the physical mechanism behind the mathematics?

Claim #5: Those scientists who believe in quantized red shifts represent a very small minority.

Response: How many are aware of the effect, and have researched its claims and implications? Hardly any.

Claim #6: Some scientists hold that causes of uneven patches of matter are due to a fluctuation of the Big Bang spatial explosion, large-scale structures and local clustering can mimic the appearance of red shift quantization.

Response: But this is nothing but grasping at the wind, as we have seen with inflation, dark matter, dark energy, multiple universes, etc.

The Geocentric View

Contemporary science contends galaxy red shifts are seen from a moving platform, the Earth. Local Doppler red shifts would be imposed on the red shift readings taken directly from the telescope. There is the orbital motion of the planet, the motion of the solar system (the sun), the Milky Way, and the Local Group – all with separate speeds and directions through space. This set of motions, incompletely known, would have to be subtracted from each red shift motion to eliminate the grand procession of the Earth and the groups to which it belongs. But subtraction or correction is only done for the first two motions – the orbit around the sun and the solar motion around the galaxy center, the galactocentric frame of reference! The Milky Way motion and the motion towards Leo were unknown at the time and were not taken into account, yet they represent the largest component of the Earth's motion – about 600 km/s! This is huge compared to the levels observed – as low as 12 km/s. Are we to believe that from all other locations in the universe we will observe this same quantum red shift by embracing the rule of uniformity – the cosmological principle? How can the red shifts exhibit the quantum breaks without any further data massaging for the largest motions? Unless, of course, the motions of the Earth are fictitious!

If Earth were not central, arcs of each shell would be seen with varying red shifts. In geometry, concentric circles can have but one center. All quantum red shifts indicate that the Earth is the center of this incredible phenomenon. Any other location would break the quantum levels, smearing them out, as was expected prior to the discovery by Tifft.

Geocentric Theory Summary

The basic premises are:

1. Red shift spacings correspond to groupings of distances
2. Galaxies are located in concentric shells around us
3. This effect could not be accidental.
4. Red shift jumps strongly support the view that we are the physical focus of the universe.

The Red Shift Anomaly (1990)

Claim: Red shift data interpreted according to the Big Bang standard model asserts that most star systems are radially receding from Earth; some in deep space are doing so at speeds close to (more than half) the speed of light. Over a six-month interval, stars on the ecliptic will show a radial velocity variation of about 60 km/s, which is due to the Earth's 30 km/s orbital speed. The Earth's rotation and revolution are removed from the computation and the observed radial velocity is specified relative to the sun, the heliocentric radial velocity. The radial velocity is easy to obtain from a spectrograph and the precision is independent of distance, unlike proper motion and parallax.

Response: All physics discussions base the redshift anomaly on the premise that the Earth is moving around the sun. As described above, computations are transformed to the heliocentric system, with the intent of eliminating the Earth's motion from the data. This only serves a counter purpose if the Earth is stationary in space. The heliocentric corrections give motion to the Earth it doesn't really possess, and from those erroneous "corrections," which are based on a false premise (*i.e.*, the Earth is moving), is generated a false conclusion.

If the heliocentric correction were applied, the only way the annual red shift variation could be tested (NB: tested, not speculated) would be to put a measuring device at the sun's location and record the Doppler shift from any given star. That this is a practical impossibility is no problem for the modern physicist, since empirical tests are replaced by pure thought – gedanken experiments. The proof is unfalsifiable.

Finally, even if the redshift could be measured from the sun's location, all that would tell us is the relative motion between the sun and the star. The shift would be exactly the same, regardless of whether it is the sun or the other star that is stationary, or even if both are in motion.

Cosmic Megawalls (1990)

Observations are made of galaxy redshifts within a cone of observation 7 billion light years long and centered on the Earth. The analysis relies on the modernist Hubble law – that red shifts are truly indicative of distance.

Mirabel and Rodriguez Superluminal Galactic Source (1994)

Apparent velocities greater than ***c*** (superluminal) have been inferred for radio-emitting components in a number of distant quasars and active galactic nuclei. The central object emits jets of subatomic particles from its poles; in these jets the rapidly moving material was tracked. The components were moving from the center at rates greater than ***c***. The accepted explanation: plasma clouds were ejected in opposite directions from the core at speeds close to ***c***; relativistic effects led to the apparent superluminal motion. But analysis of deep space objects introduces many potential errors of assumption.

Mirabel and Rodriguez saw the first superluminal motion ever detected in an intragalactic source. The source is ejecting matter in a similar process but on a smaller scale than that seen in quasars. Using Very Large Array (VLA) technology, they discovered that a small, powerful object in our own cosmic neighborhood is shooting out material at nearly the speed of light. After accounting for direction, the material appears to be traveling faster than ***c***, superluminal motion, prohibited by Einstein's second Special Relativity theory postulate.

Relativity's View

Seeing a visibly-superluminal expansion or motion of a distant object does not necessarily imply that anything actually exceeds ***c*** locally. If a subluminal object is moving at a small angle along the line-of-sight it can appear to be going faster than light, but is not. This is different from any uncertainties in distance scales.

A remarkable ejection event was seen where the object shot out material in opposite directions. The core remained stationary, while the approaching bolide was apparently moving at 125 percent of the speed of light. After correcting for relativistic effects, they conclude that the ejected material actually is moving at 92 percent of light speed, more than 171,000 miles/second. This event ejected a mass equal to one-third that of the Moon with the power of 100 million suns.

Claims and Responses

Claim #1: Thirty years ago superluminal motion was used as evidence against quasars having deep space distances. Today most physicists believe that velocities greater than ***c*** are optical illusions and involve no physics which contradicts the theory of Special Relativity.

Response: Exactly what is acceptable evidence of speeds greater than light speed, if all visual proof is dismissed as illusions – ESP?

Claim #2: The superluminal explanation is a light travel time effect. Any light from glowing matter moving close to head-on towards Earth at nearly

c will take a shorter time to travel as it nears Earth. If you don't correct for this decreased time the light speed will be overestimated. In other words, if you calculate how fast that blob is moving, assuming that it is moving perpendicular to the line between you and the galaxy, and you underestimate the time interval by ignoring the fact that it is also moving towards you, then you will get a speed which can be many times the speed of light.

Response:

1. Whether the source is moving toward, away from, or tangent to our sight line, Special Relativity theory says the observer will always measure ***c*** as constant. So it makes no difference.
2. This is a good example of how Relativity theory turns reason upside down. If an object approaches Earth at a small angle, it will appear to be moving much slower than it actually is, because only sideways/transverse motion is visible. The logic above argues that the object is moving much slower than it seems!
3. If time is shortened, so are the distances, by Lorentz contraction and the foreshortening by perspective in # 2

Binary Star Precession (1995)

Six analyses of the orbital precessions of the planet Mercury, the moon, the major satellites of Jupiter, Saturn, Uranus, and four binary stars have been done to examine whether classical Newtonian tidal effects may completely account for excess precession, eliminating a key proof for General Relativity.

Analysis of Binary Star Precession

1) For two binary stars, DI Herculis and AS Camelopardalis, General Relativity predicts double the measured orbital precessions.
2) The orbital period decay of binary pulsar PSR1913+16 has been attributed to energy lost via gravitational wave radiation, a General Relativity effect never detected in other experiments. This decay could also be a classical propagation speed of gravity several million times the speed of light, as Van Flandern has convincingly argued, using the lack of gravitational aberration in astronomy. Such a speed would vitiate Special Relativity and General Relativity theory.

3) Classical tidal effects with a speed of gravity several million times the speed of light in a Euclidean 3D space and time reasonably explains the empirical orbit precessions and decays.

Orbital precession comparison

Binary Stars	Gen. Relativity	Actual
DI Herculis	2.35 degrees	1.05 degrees
AS Camelo	26.8 degrees	15.00 degrees

Propagation Speed of Gravity

For a speed of gravity equal to the speed of light in classical physics, the radial distance can change significantly. Applying equal speeds and Newton's law to the Earth-sun eccentric orbit yields a decay of 15 seconds per year, and a decrease in major axis of 30 miles per year. Neither of these orbital changes are measured. If gravity's speed is three million times the speed of light, the axis would only shrink about 0.6 inches per year.

Aspden Effect (1995)

An Adams motor with a magnetized rotor and no electrical power input is started on no load by a drive motor and brought up to operating speed of 3250 rpm, then runs steadily at that speed for two minutes. With a machine rotor of 800 gms, its kinetic energy and that of the drive motor is less than 15 joules, contrasting with the 300 joules needed to spin up from rest.

After five minutes or more, the machine is stopped, but can be restarted up to speed in the same or opposite direction with only 30 joules, only 10% of the original effort, provided that the machine is not stopped more than about a minute. This totally violates all known laws of physics. It is ten times easier to spin the magnet once it has already been spinning. (The term for this is *hysteresis*, a memory of prior physical states).

Energy within the magnet seems to continue "spinning" inside even when the magnet is not moving (similar to stirring up a glass of water and then removing the stirring rod, while the glass itself remains still). It will take less energy to stir up the water in the glass again if you wait less than a minute before trying. So it certainly appears that this energy in a magnet is in a form of fluid motion, possibly spiraling in a vortex, like the water example.

The experimental evidence is that there is something that is:

- spinning,
- invisible,
- having energy of motion,
- occupying the space within the machine rotor.

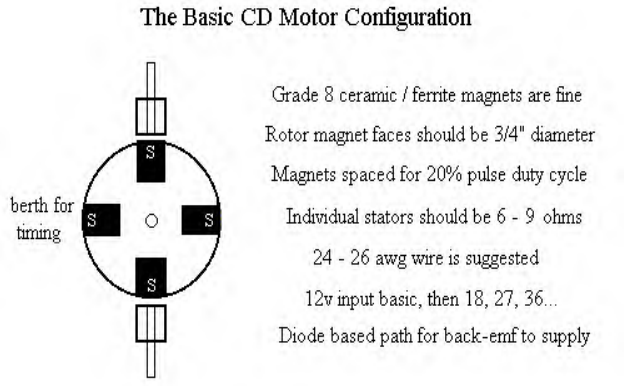
This “something” has an effective mass density 20 times that of the rotor, but spins independently and takes several minutes to decay/wind down, while the motor itself comes to rest in a few seconds. Various machine configurations tested indicated two dependencies:

- time of day
- compass orientation of the spin axis.

One machine with weak magnets showed evidence of gaining magnetic strength with each test, as if permanently absorbing the ether energy.

Another separate experiment consisted of a reversible D.C. motor running in a clockwise sense for two or three minutes, drawing from the power supply, but then spontaneously slowing down, stopping, and then reversing rotation and rapidly gaining speed, as if counter-clockwise was the preferred sense of rotation. It was running well clockwise, with no external influence given to change direction.

The basic motor used by Aspden consists of a central rotor either all north out, or all south out, and high resistance coils.


The Basic CD Motor Configuration
berth for timing
S
S
O
S
S
Grade 8 ceramic / ferrite magnets are fine
Rotor magnet faces should be 3/4" diameter
Magnets spaced for 20% pulse duty cycle
Individual stators should be 6 - 9 ohms
24 - 26 awg wire is suggested
12v input basic, then 18, 27, 36...
Diode based path for back-emf to supply

Aspden rotor motor[309]

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[309] http://upload.wikimedia.org/wikipedia/en/e/e8/ Cdmotor2.gif

Aspden ether principles:

1) Extraction of energy from the ether does not violate the first law of thermodynamics, conservation of energy, if energy flows from ether to matter. If the ether delivers energy to run the motor, eventually that borrowed energy is returned to the ether by generating heat and radiation.
2) Existence of the ether was not disproved by Einstein. Special Relativity only says it is not necessary; General Relativity theory disguises it as "space-time curvature," while moderns call it "the vacuum."
3) Ether has been measured in laboratories. The ether was probably first detected by Sagnac in 1908, the experimental source of the modern ring laser gyro. How can the speed of a laser beam traveling a circuit inside an optical instrument detect rotation of that instrument, unless the beam is keeping a fixed speed relative to something inside that instrument that does not share its rotation? That something is the ether!
4) Its existence was not disproved by the Michelson-Morley experiment. Michelson was trying to sense the Earth's motion through the ether, but violated the Miller condition for minimal ether shielding.
5) The ether reveals its existence when we have rotation, as in the Adams motor.

Marinov: The Self Accelerating Plasma Tube (1996)

Motor operation:

A cylindrical magnet is cut along one of its axial planes and the one half is turned up-side-down (the magnetic forces themselves do the rotation). Around this magnet there is a channel filled with mercury in which the copper ring floats. After sending a large current from the battery, the ring begins to rotate without any external mechanical stimulation.

Generator operation:

Mechanically rotate the copper ring clockwise and it will generate power in the same direction of current flow. Marinov has demonstrated and proved this in his tests. There is no opposing torque to the direction of rotation and the device is said to be self-accelerating. As long as power is drawn from it, it will power itself. Friction will easily stop the self-accelerating process, due to the low torques generated.

Atmospheric rotation:

The Earth's magnetic field has the same shape and properties as Marinov's cylinder magnet. The sun constantly supplies a current of charge via the solar wind, the same as Marinov's battery. By analogy the Earth's ionosphere will act like the copper ring and rotate as long as the electron flow is present – that is, constantly. The ionspheric motion, in turn, will drive the lower stratosphere and troposphere to produce their observed circulation patterns. An event supporting this idea was the unexpected vaporization of the tether used to connect two artificial satellites, an indication of a large current flow. Was it tapping into a huge energy reservoir that drives the global air circulation? The plasma tube has no mechanical parts; if friction can be reduced sufficiently, even the smallest amount of torque on the gas plasma will accelerate it.

Casmir Force (1997)

The Casimir force is counter-intuitive but well understood. In quantum mechanics, all fields, in particular electromagnetic fields, have fluctuations. At any given moment their actual value varies around a constant, mean value. Consider the gap between two plane mirrors as a cavity. Casimir realized that when two mirrors face each other in a vacuum, vacuum fluctuations exert radiation pressure on them. On average the external pressure is greater than the internal pressure, causing mutual attraction by the Casimir force.

All electromagnetic fields have a characteristic spectrum containing many different component frequencies. Inside a cavity, where the field is reflected off the walls of the container, the field is amplified if integer multiples of half a wavelength can fit exactly inside the cavity. This wavelength corresponds to standing waves or a "cavity resonance." Any other wavelengths suppress the total field. Vacuum fluctuations are suppressed or supported depending on whether their wavelengths correspond to a cavity resonance or not.

Radiation pressure of the electro-magnetic field increases with energy and frequency. At a favorable frequency radiation, pressure inside the cavity is greater than outside and the mirrors are repelled. At an unfavorable frequency, the inside radiation pressure is less than outside and the mirrors attract. Large wavelengths cannot fit between mirrors only microns apart, so the large wavelengths are suppressed, and also the inside radiation pressure compared to the outside pressure.

The force, *F*, is proportional to the cross-sectional area, *A*, of the mirrors and increases 16-fold every time the distance, *d*, between the mirrors is halved:

$$F \sim A/d^4$$

Two mirrors with an area of 1 cm^2 separated by a distance of 1 μm have an attractive Casimir force of about 10^{-7} N – about the weight of a water drop. At separations one hundred times smaller and about a hundred times atomic size the Casimir effect produces 1 atmosphere of pressure.

Summary

Two metal plates isolated in a vacuum are pushed together because the zero-point vacuum field pressing against the outside of the plates is a little stronger than that against the inside. The existence and intensity of the Casimir force have been experimentally verified many times in the 50 years since Casimir's revelation.

Claim: The presence of conducting metals and dielectrics alter the energy of the electromagnetic field in the Casimir effect.

Response: Since the energy depends on the shapes and positions of the conductors and dielectrics, the Casimir effect matches the characteristics of the ether, which is affected by the type, size and location of ambient objects, as Miller and others have shown. Is the modern quantum vacuum-field nothing more than the ancient ether?

Magnetic Memory, Roth (1997)

A magnetic torsion beam was suspended and balanced at its center. A strong magnet is then placed on a table with one pole facing the suspended torsion beam to attract it. After five days the magnet can be moved a considerable distance from the balanced torsion beam but the beam will still be attracted as though the magnet was still there. Note: The magnetic torsion beam is simply a bar magnet hanging on a string.

Interpretation:

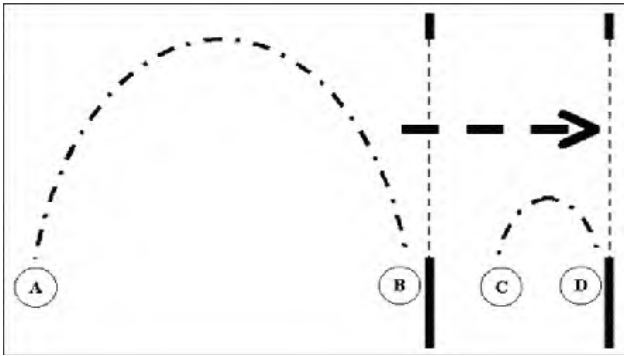
If a magnet stays in one place long enough, it can cause the ether flowing through nearby objects to move in a certain preferred direction instead of in any random direction. Just the presence of the magnet close by provides the extra energy to keep the ether flowing.

With respect to this property of the ether, it acts like a siphon. Once the water flow is started in a siphon, atmospheric pressure will keep the flow going until the container at higher level is emptied into a lower level container. There is greater atmospheric pressure on the surface of the water compared to the smaller pressure at the hose end.

By analogy, if magnetism is an ether flow, once started through a local area of space, it can continue with the same force even with the starting magnet farther away. It is as if a temporary ether current is created in the fabric of space – certainly an atypical property of magnetism.

Wang Superluminality (2000)

In Wang's experiment, a pulse of light passed through a small cell filled with specially treated cesium gas. A light beam traveling through the cell has two different velocities, a velocity for the individual light waves in the beam and a group velocity for the entire beam. Some light waves in the beam can actually travel backward, reversing the front and back edges momentarily. Different parts of the beam can leave the gas cell at different times, creating the effect that parts of the light beam have left the cell before other parts even entered.



Wang experiment[310]

B-A are front and back edges of initial pulse
D-C are front and back edges of transmitted pulse
Height is light intensity, vertical dashed lines outline the Ce cell

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[310] http://www.metaresearch.org/home/Viewpoint/archive/ 010824FTL/FTL%20Light%20Pulse.gif

- B and A are timed when entering the center slit in figure above, moving to the right
- D and C are timed when entering the right exit slit.
- The front edge B-D moves at ***c***.
- The back edge A-C is timed moving faster than ***c***.
- C actually exits the cesium cell before A enters it!

Before the trailing edge of the pulse had fully entered the cell it was detected 60 ft beyond the cell. This is bi-location, existence in two separate places at once, equivalent to traveling 300 times faster than light, according to Wang.

Problems:

- Light jumping forward in time implies an effect before its cause – a philosophical violation of causality.
- The clash with Einstein's theory of Relativity which asserts ***c*** is isotropic and no object or information can travel faster than ***c***.
- Italian physicists have also succeeded in breaking the light speed barrier, propagating microwaves at 25% above normal light speed c, supporting superluminality. Possibly the most important evidence that the physical world may not operate according to many of the accepted beliefs of Relativity.
- Aroused fierce debate over its meaning, interpretation and consequence for current beliefs.

Alternate explanations:

- pulses get distorted when passed through any media other than a vacuum
- Wang's interpretation doesn't tell the whole story; it can be interpreted incorrectly.
- even if such a beam can be proved faster than ***c***, it would not be able to carry any information.

Holger Müller (2002)

Müller made use of two devices known as "optical cavities," two mirrors held at a constant distance, pointing in different directions. A set of standing light waves in a chilled cavity was monitored over a 190 day period, more than 1/2 of the Earth's orbit, altering the velocity of the equipment by a net change of 60 km/sec.

The round-trip time of a light beam between the mirrors is a direct measure of the speed of light perpendicular to the mirror surfaces. If ***c*** were to vary with lab speed, then the constant comparison of the standing waves to a highly stable atomic clock would fall out of resonance with the cavity. Any dependence of this speed on direction would be evident when the cavity is rotated.

To avoid errors caused by temperature effects and material aging processes, cavities were made from a pure sapphire crystal, virtually immune from aging, and operated at the temperature of liquid helium, near absolute zero. Being made of sapphire, the cavity has very little thermal expansion at a temperature of 4° K.

Using advanced laser techniques for reading the cavity round-trip time, a new limit on possible violations of light propagation isotropy was established. The latest experiment is part of a whole new generation of Relativity tests. The stability of the resonance frequency produced a three-fold improvement in precision over past experiments. A 100-fold improvement in the near future is anticipated.

Protocol Precautions:

- relies solely on Earth's rotation – no turntable vibration.
- avoids the systematic effects associated with active rotation
- overcomes the creep of room temperature resonators made from glass ceramics, *e.g.*, ULE (UltraLow Expansion)

Comments:

The experimental care taken in this experiment is impressive, but futile, if intended to detect the influence of the ether on ***c***. Lessons learned long before have been forgotten. The experimenter's text below indicates the missteps taken: solid silica and sapphire crystal; and vacuum-sealed, instead of a gaseous medium.

> At the core of the experimental setup is an optical cavity fabricated from fused silica (L = 3 cm, 20 kHz line width) which is continuously rotated on a precision air bearing turntable. Its frequency is compared to that of a stationary cavity oriented north-south (L = 10 cm, 10 kHz line width). Each cavity is mounted inside a thermally shielded vacuum chamber.

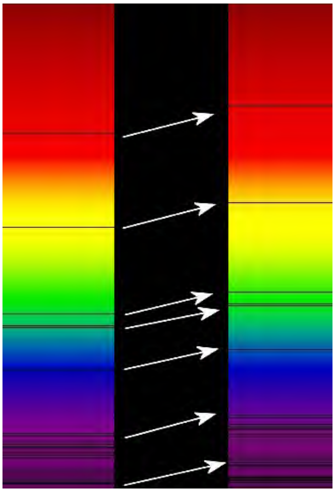
The apparatus diagram, although only a schematic, indicates the clutter of support and ancillary structures used in a vain attempt at accuracy. It is also a safe assumption the experiment was performed in a laboratory, buried in the bowels of a building. Can sunlight be detected in a windowless cellar? What value would be placed on a null result of $< 10^{-15}$ for sunlight detection, if the cellar shielded the detector from the sun? Would we say there is no sunlight, because the experiment was done in darkness? Modernists should review the Miller experiment of 80 years ago.

Quasars in galaxies (2004)

NGC 7319 is a Seyfert 2 galaxy with a small red shift of 0.0225, shrouded with heavy dust clouds that obscure the bright, active nucleus. Big Bang theory understands red shift as proportional to distance – the larger the red shift, the farther the object must be. Another Big Bang belief is that red shift measures velocity – the larger the red shift, the faster it's receding from us.

The Big Bang's Hubble law places the quasar billions of light years beyond the galaxy, because of its much larger red shift. Yet the galaxy is opaque, so it must be near the dust surface or even in front of it! There is also a bright triangular jet of disturbed gases, with the wide end on the galaxy nucleus and the thin end pointing at the quasar. The gas turbulence indicates that something large and powerful has been ejected from the nucleus. The region near the quasar is glowing with extra emission lines from ionized gases. The only candidate for the ejecta is the misplaced quasar.

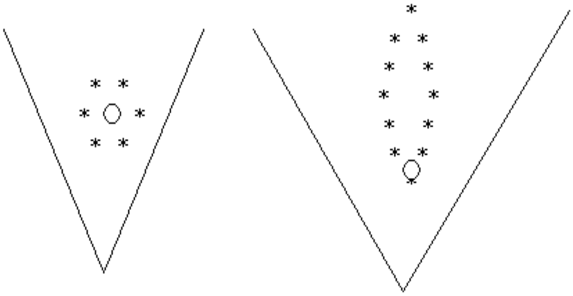
Halton Arp has been gathering Big Bang discordant redshift evidence since the late 1960's. He has found 20 ultra luminous X-ray sources (like the quasar pictured above) that also have red shifts much higher than the galaxy to which they are physically connected. So, if astronomy were a logical science, wouldn't this evidence mean the end of the Big Bang? The paper was barely noted when presented to the American Astronomical Society meeting in January 2004. As of April 2006, it still awaits the heavy editing recommended by the peer review committee. Isn't it time for Big Bang theory to retire? Shouldn't astronomy be an adventure in the discovery of truth rather than cutthroat competition for funding?



Redshift of optical spectrum in a distant supercluster(right), as compared to the Sun (left).[311]

Description:

Redshift surveys include the first, the CfA Redshift Survey, 2dF Galaxy Redshift Survey, Sloan Digital Sky Survey and DEEP2 Redshift Survey. The Big Bang theory defines the size, the shape and the age of the universe as an expanding sphere 78 billion light years in diameter and 13.7 billion years old. Faith in Hubble's law has distorted most of the distances to galaxies, quasars, and gamma ray bursts.



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[311] http://upload.wikimedia.org/wikipedia/commons/thumb/1/14/Redshift.png/ 200px-Redshift.png.Licensed under GNU 1.2.

Red shift survey slices: Arp and Big Bang models of the universe

Halton Arp's research shows that redshift cannot be a linear measure of distance. The diagrams above each show a slice of the sky, with Earth always at the center. Arp's view (left) is matched with the Big Bang (right). The size of the dots represents the galaxies' size, but the redshift is inversely proportional to size, *i.e.*, the large central galaxy has the lowest redshift. At the edges are the quasars, the high redshift objects. The Big Bang image at the right shows the distortion of the galaxy cluster produced by Hubble's law, that is, a circle/sphere in reality becomes an elongated bubble. Every cluster in the sky forms these fingers of God aimed at us from everywhere in the sky.

Without the Hubble distortion, the age and size of the universe is unknown, because we can't project backwards in time to the Big Bang explosion. Most objects are closer than once thought, but now there is no universal yardstick. We are back on square one; all is unexplored and up for grabs. At least we know what is not true: the Big Bang.

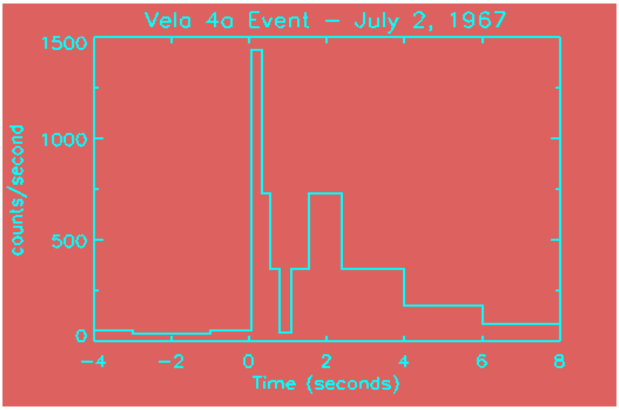
Claims and Responses

Claim #1: The *Fingers of God* effect that causes clusters to be elongated toward the observer is caused by a Doppler shift associated with the peculiar motion of the cluster galaxies. Gravity in the cluster causes large velocities that change the redshifts of the galaxies. The Hubble Law relationship is affected, leading to inaccurate distance extrapolation.

Response: When it suits the Big Bang model, redshift data is taken as one number. When a single number presents a problem for Big Bang, then the redshift is split into a cosmic component for the expansion of space and a proper component within the expanding space for the object's velocity. The reasoning above adds a third meaning to the redshift mix – cluster gravity – another escape hatch when geocentrism is implied. More additions are expected in the future.

Claim #2: A similar illusion, the Kaiser effect, is caused, not by random internal motions of the cluster, but by coherent motions of galaxies collapsing towards the cluster center during assembly. This affects the largest scale structures.

Response: See prior comment.

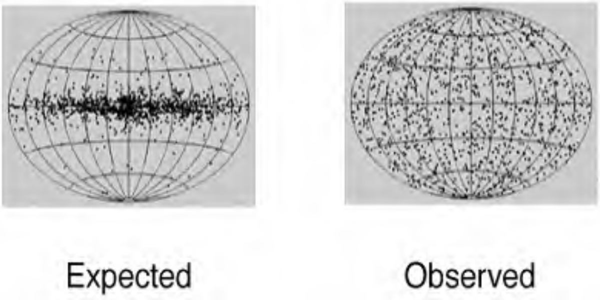


Gamma ray bursts (2006)

Intensity pattern of first Gamma-Ray Burst[312]

Gamma-Ray Bursts (GRBs) were discovered by accident forty years ago. The Vela satellites were developed to monitor nuclear test ban treaties. Their sensors watched for brief x-ray and gamma-ray flashes, the telltale signatures of nuclear explosions. The Velas did find flashes of gamma rays, as designed, but they were coming from deep space. Data plotted (see above) show that the gamma count rate sharply jumped from the cosmic gamma-ray bursts. These phenomenal bursts of radiation originated from the observable ends of the known universe. Dramatic though the discovery of Gamma Ray bursts was, there is nothing particularly rare about them since they were, and continue to be spotted at a rate of around one a day.

Gamma Ray Bursts are of extremely short duration and fall into two categories; one lasts less than a second, the second about 30 seconds.



Distribution of Gamma Ray Bursts in the Sky[313]

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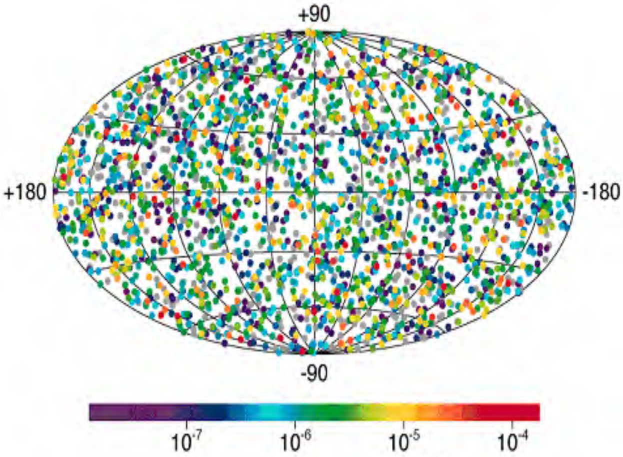
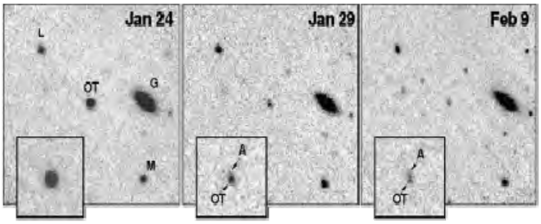
[312] http://antwrp.gsfc.nasa.gov/apod/image/0007/firstgrb _vela4.gif. Credit: R. Klebesadel, I. Strong & R. Olson (LANL), Vela Project.



2512 BATSE Gamma Ray Bursts[314]

If Gamma Ray Bursts were from the Milky Way, then the furthest and faintest ones would be seen towards the Galactic plane and center. BATSE satellite surveillance found that every category of Gamma Ray Burst, whether chosen by flux, fluence, hardness, duration, or any other parameter, is distributed isotropically.



Evolution of a Gamma Ray Burst (NASA)

In the January 24 image, the flash of the optical transient (OT) associated with the Gamma Ray Burst dominates the host galaxy image (A); by January 29, the galaxy has been resolved from the OT. The February 9 image shows the OT fading.

Although a Gamma Ray Burst only lasts for a few seconds, the afterglow can linger for weeks or even months. The afterglow follows a descending path of energy loss, through X-rays down to radio waves.

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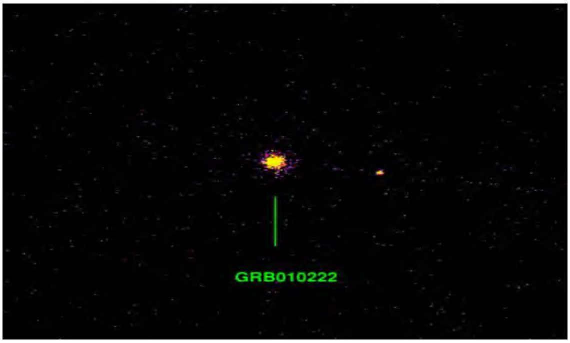
[313] http://www.astronomy.csdb.cn/heasarc/docs/objects/ grbs/grb_distributions.gif
[314] http://agile.gsfc.nasa.gov/Images/objects/heapow/ transients/batse_bursts.jpg

Because the afterglow is much longer-lived than the initial explosion, it may be studied at leisure, without time pressure. By watching the fading of the optical remnants of GRBs, astronomers concluded that the explosions were embedded in faint galaxies.



GRB010222: Gamma-Ray Burst, X-Ray Afterglow [315]
Credit: L. Piro (CNR) et al., CXC, NASA

A fading afterglow in a false color image is shown from the Chandra X-ray Observatory. GRB010222 was visible for only a few seconds at gamma-ray energies, but its afterglow was observed for days by x-ray, optical, infrared and radio instruments. The x-ray glow, hours after the initial explosion, suggests an expanding fireball moving at near light speed hitting a wall of relatively dense gas. The cosmic blasts may be hypernovae – the death explosions of very massive, short-lived stars.

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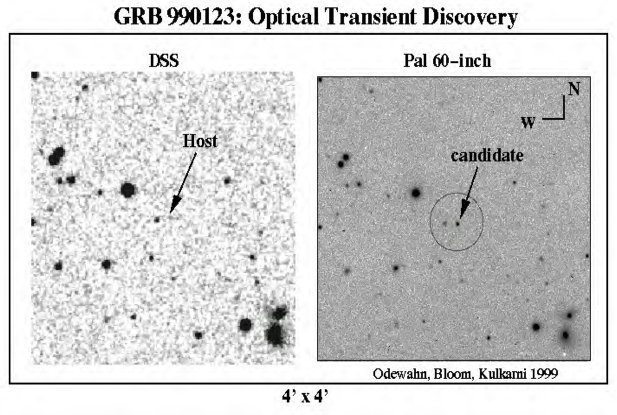
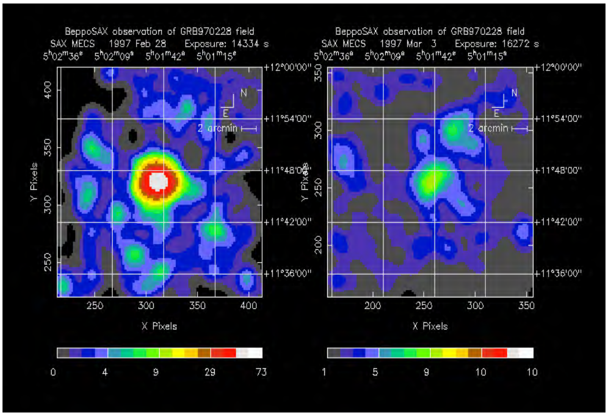
[315] http://heasarc.gsfc.nasa.gov/Images/objects/heapow/transients/chandra_grb010222.jpg


GRB 990123: Optical Transient Discovery
DSS
Pal 60-inch
N
W
Host
candidate
Odewahn, Bloom, Kulkarni 1999
4' x 4'

Galaxy And Gamma-ray Burst[316]
Credit: Courtesy J. S. Bloom
(Caltech-CARA-NRAO GRB)



GRB Afterglow[317]

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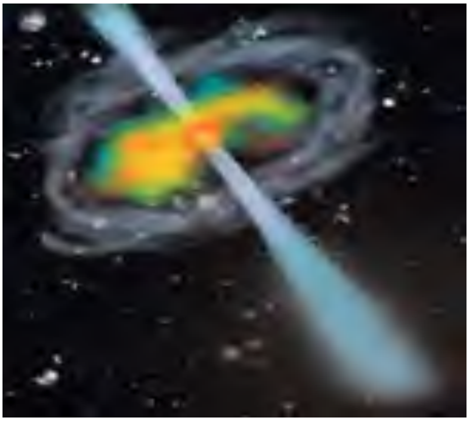
[316] http://antwrp.gsfc.nasa.gov/apod/image/9901/ grb990123_compare.gif
[317] http://bepposax.gsfc.nasa.gov/bepposax/first/ grb_970228.gif

GRB990510
May 11th
06:00 UT
May 12th
00:00 UT

GRB 990510: Another Unusual Gamma Ray Burst[318]
Credit: J. Kaluzny (Warsaw U. Obs.)
et al., 1-meter Swope Telescope



Conception of a Gamma Ray Burst beam[319]

A beamed explosion is directed like a flashlight, while an isotropic explosion is dispersed outward like the emission from a light bulb. It appears to dim much more rapidly than isotropic light. If gamma-ray bursts are beamed, the energies we are seeing are less than thought, but that also means there are more of them that we don't see. If the explosions are beamed in just one direction, only those observers located along the path of the beam would see them. That means there could be gamma ray bursts exploding all the time, but because the beams are focused in other directions we don't see them. Regardless of whether or not we see the beams of gamma rays, we would still be able to see their afterglows, because afterglows are always isotropic. So, if we find afterglows without seeing the initial bursts, this would prove Gamma Ray Burst explosions are beamed. This is not the case. Afterglows are always associated with Gamma Ray Bursts; Gamma Ray Bursts are isotropic – not focused.

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[318] http://antwrp.gsfc.nasa.gov/apod/image/9905/ grb990510_lc1.jpg
[319] http://agile.gsfc.nasa.gov/Images/objects/grbs/ grb_art_small.jpg

Gravitomagnetic London Moment (2006)

Scientists have measured the gravitational equivalent of a magnetic field for the first time in a laboratory. The effect is much larger than expected from General Relativity.[320] Martin Tajmar and colleagues have measured a new effect, named the Gravitomagnetic London Moment, with a ring of superconducting material rotating up to 6,500 times a minute. Spinning superconductors produce a weak magnetic field, the so-called "London moment." The new experiment tests whether a gravitomagnetic field will appear in the spinning superconductor. Small acceleration sensors placed close to the spinning superconductor recorded an acceleration field outside the superconductor that appears to be produced by gravitomagnetism.

This experiment is the gravitational analog of Faraday's electromagnetic induction experiment in 1831. It demonstrates that a superconductive gyroscope is capable of generating a powerful gravitomagnetic field, the gravitational counterpart of the magnetic coil. Although it is just 100 millionths of the acceleration due to the Earth's gravitational field, 10^{-4}g, the measured field is a shocking one hundred million, trillion, times larger (10^{14}) than Einstein's General Relativity predicts. The researchers were reluctant to believe their own results:

> We ran more than 250 experiments, improved the facility over 3 years and discussed the validity of the results for 8 months before making this announcement. Now we are confident about the measurement…

…says Tajmar, who hopes others will verify the results that challenge current Relativity theory thinking.

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[320] http://physorg.tradepub.com/?pt=cat&page=_INTL

Summary of Data and Experiments

S = supported, D = disproof,
N = neutral or does not apply

Notes: "S" for an experiment does not indicate a proof or confirmation. All empirical evidence is inductive, increasing the probability of the theory's validity, but never excluding future improvement or even abandonment. "D" in any column for a theory requires responses to remove it, otherwise there is no rational reason to maintain a paradigm that cannot explain one or more experimental results within its scope. Only experimental evidence and common experience are investigated below. Theory is discussed as it pertains to the experiment. The first row is the consensus proposed by scientific opinion, which is often far from unanimous – especially in the interpretation of results by relativists. This also holds for the summary columns. The second row of each experiment is the geocentric view.

Galileo, Jovian Moons, 1609

Proposal: His observations showed four moons were actually orbiting around Jupiter. Here was incontrovertible proof that the Earth was not the center of the Universe.

Summary: Geocentric = NA, Heliocentric = NA, Ether = NA, Special Relativity = NA, General Relativity = NA

Geocentric Response: Geocentrism would only be disproven if Jupiter or its moons were stationary. This is instructive in showing the difference between revealed Geocentrism and the human fallible models that try to implement Geocentrism.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Galileo, Venus Phases, 1609

Proposal: Venus cycles through a complete set of phases, just like the Moon. Venus is never very far from the sun so in the Ptolemaic system Venus should always be in crescent phase as viewed from the Earth because it can never be far from the direction of the sun which always lies beyond it. Since Venus did not go around the sun, we would never see all sides of it. But the Copernican model does account for the phases.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: Again, a fault in a particular model of Geocentrism does not disprove it, but shows the model needs correction. Venus orbits the sun in both Copernican and Tychonean models, but the sun orbits the Earth only in Tycho's model, consistent with Geocentrism.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Galileo, Tidal Flow, 1609

Proposal: Just as water sloshes back and forth in a swinging container, Galileo reasoned that the Earth, as a giant vessel spinning on its axis, might cause the seas to rise and fall twice a day. The tidal motions of the Mediterranean offered proof that the Earth moved.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: Even modernists reject this theory, attributing the tides to the Moon's motion around the Earth. (The only motion with which Geocentrism and modern physics agree is the motion of the Moon around the Earth.) Caution: Even here the lunar cause of tides may be only be indirect; the ether flow varies with latitude, which is the direct cause of the two tidal bulges!

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Stellar Aberration, Bradley, 1727

Proposal: Annual aberration proves that light has a finite speed and that the Earth is moving around the sun. This is inconsistent with a simple model of light as waves in an ether which is dragged along by the Earth; it is consistent with Special Relativity.

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: Bradley's formula explaining aberration is based on a Copernican model, which conflicts with the Relativity paradigm. Neither is correct in the geocentric model, where stellar aberration is intrinsic to the motion of all the stars, not an apparent optical effect caused by terrestrial motion. It is similar to the higher order motions of the sun and moon and planets, their actual or proper motions undistorted by deviation from geometrical optics.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Diurnal Aberration

Proposal: Diurnal aberration is caused by the velocity of the observer on the surface of the rotating Earth. It depends on the local time and location of the observer. Much smaller than that of annual aberration, it is only 0.32" at the equator, where the rotational velocity is greatest.

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: Just like the annual aberration, the daily pattern is caused by the motion of the ether, not N-S but the principal daily E-W motion. Both are ether effects.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Binary Star

Proposal: Doppler shifts of binary stars indicate their radial velocity, but this same velocity when tangential to the view from Earth does not produce the expected corresponding stellar aberration. During the period of the orbiting star in a binary system, that star should oscillate due to aberration, using the relative velocity between the source and the Earth. The smaller star in binary systems generally has velocity components much larger than the Earth's orbital velocity.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: If the aberration is due to relative motion, there should be a very large stellar aberration seen from Earth, 10 and even 100 times larger than the amplitude observed by Bradley. This aberration from those fast moving stars is totally absent, even if the relative velocity with respect to Earth is very large. All these observations contradict the principle of relative motion. Bradley even deduced the Earth's velocity around the sun, contrary to this cherished principle.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Planetary Aberration

Proposal: Planetary aberration of any solar system object is the combination of the aberration of light due to Earth's orbital velocity and light-time correction due to a planet's distance from earth. Both are determined at the instant when the object's light reaches Earth. The prediction for individual planets is uncertain.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: The computations are greatly confused by the antagonism between the Bradley and Special Relativity theories. Discussion of experimental results are hard to find.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Solar Wind

Proposal: The solar wind is a stream of charged particles, mostly protons and electrons, emitted by the sun's surface. On the average, it appears to come not directly from the sun but 4 degrees behind the sun's position, due to the orbital velocity of the Earth. In the frame of the Earth the solar wind appears to move as if it had the Earth's velocity, but in the opposite direction.

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: The solar wind aberration can be explained simply by reversing the words “solar wind” and “Earth” above. Why do the followers of Special Relativity never want to use the static Earth possibility, which viewpoint Special Relativity allows as much as a moving Earth?

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Motion of the Moon

Proposal: Refers to the motion of the moon as seen from Earth. Like the sun, the moon is not an astronomical point source, with an ill-defined limb. What speed should be used for lunar aberration computation? The Bradley value of 30 km/s, the orbital speed of the detector on earth? The relative speed of the Earth – moon system?

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: Well, it does not matter. They are both wrong. Lunar laser ranging (LLR) experiments (bouncing laser beams off retro-reflectors placed on the moon by astronauts) shows there is no aberration. The moon is really where it appears to be. Why no lunar aberration? It is almost as though the Earth weren’t moving, but Who would ever say that?

Summary: Geocentric = S, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = D

Satellite to Star

Proposal: For Bradley the aberration would be a constant 20”. For Special Relativity the periodic motion of the LEO orbit satellite adds a ± 5”, so the aberration varies from 15” to 25”, as observed.

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: But what about the motion of the solar system and galaxy at hundreds of km/s? Why are these motions ignored, though much greater than orbital motions? Special Relativity ignores what doesn't fit. The geocentric model explains the 20" stellar aberration of Earth as the actual intrinsic motion of the stars (or an ethereal effect). The satellite contribution of 5" is a true aberration, correctly predicting the stellar aberration when seen from a satellite (Hubble).

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Satellite Downlink

Proposal: Its speed is 8 km/s and period is 97 mins, which is 18 times the Earth's rotation. For Bradley, downlink signals from Hubble should have an aberration at the ground stations of 20", just as the stars do. For the relative motion of 8 km/s [not the heliocentric system used for the stars] the aberration formula for equatorial motion (latitude angle = 0) predicts $\theta = v/c = 8/3 \times 10^{-5}$ km/s ~ 5", in good agreement with the measured and easily visible aberration of 5.8"

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: The downlink should only have the travel time delay. There is no aberration for the geocentric model. For a LEO orbit of 8 km/s, the delay deflection should be about 5.3 arc sec, in good agreement with 5.8" measured.

Summary: Geocentric = S, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Satellite Uplink

Proposal: Shows the same aberration for laser signals sent ground to satellite or satellite to ground. A patent for a 'velocity-aberration correcting retro-reflector satellite.'[321]

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = S, General Relativity = N

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[321] http://www.freepatentsonline.com/5474264.html

Geocentric Response: The satellite in motion at 8 km/s should receive an aberrated signal from the stationary Earth of 5.3”, again in agreement with the measured uplink aberration.

Summary: Geocentric = S, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Earth Aberration

Proposal: As always, Bradley predicts 20” aberration for objects seen on Earth from Earth, since neither source motion or distance affects Bradley aberration. 0” is actually observed. Special Relativity predicts 0” from the relative motion of surface objects.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: Geocentrism predicts 0” aberration for surface object motions much less than ***c***.
Summary: Geocentric = S, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Fresnel, 1818-1830

Proposal: The first quantitative proposal to measure ether properties. Fresnel proposed that substantial material bodies might carry some of the hypothetical ether along with them. Fresnel ether dragging by massive objects was based on a coupling constant that modified the speed of light in transparent media.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: At this time in history the only known way of reconciling aberration with wave theory was Fresnel partial dragging. The ‘ad hoc’ remedy of Fresnel drag gave heliocentrism a temporary reprieve, but still the question of geocentrism or heliocentrism was not resolved.

Summary: Geocentric = NA, Heliocentric = NA, Ether = N, Special Relativity = N, General Relativity = N

George Stokes

Proposal: Stokes proposed a "Silly Putty" model of the ether that behaves as a rigid solid for the high-frequencies of light and as a fluid for the slower motion of celestial bodies. At the Earth's surface, the ether will be stationary. A realistic model of the ether but more complicated.
Stokes differed from Fresnel's partial dragging theory by interpreting stellar aberration as due to an ether that was totally, not partially, dragged along next to the Earth.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = N, General Relativity = N

Geocentric Response: Stokes' theory of a completely dragged ether was unsuccessful.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Faraday Rotor Generator

Proposal: Faraday found there is an induced current if a conductor and a magnet are joined together and rotated, having no relative motion. He resolved this paradox by saying the lines do not rotate when the magnet does. In the inertial laboratory frame, the axis of the magnet is at rest when the magnet rotates: in the same reference frame, also Faraday's lines of magnetic force are at rest.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: Faraday's law does not apply to this machine. There is no changing magnetic flux. The conventional resolution of the paradox follows the usual path; it ignores the simple observation that motion measured with respect to a spinless Earth has special significance. The geocentric theory solves the Faraday paradox as well as the contrived special cases of mainstream physics.

Summary: Geocentric = S, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Geometric Parallax

Proposal: As the Earth moves over huge distances in orbiting the sun, nearby fixed stars are seen to move more, relative to the farther ones, as can be seen from a moving car. Parallax is smaller than aberration; it required waiting for telescopes to improve before stellar parallax caused by the Earth's orbiting of the Sun could be detected by Bessel in 1838.

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: This is the first false "proof" of heliocentrism, which is often cited as disproof of Geocentrism. Despite the simplicity with which these claims can be refuted, it survives today even among modern cosmologists who should know better. Parallax is fine for determining distances, but for finding a fixed point it is worthless.

Summary: Geocentric = S, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Arago, 1850

Proposal: Arago looked for the expected change in focus of a refracting telescope due to Earth's motion around the sun. This is first order in *v*/*c* if one assumes light is fully dragged by the lens. Arago compared the focal length of light from a particular star at six-month intervals. The Earth's motion should alternately add and subtract the Earth's orbital speed to the speed of light, but there was no difference.

Summary: Geocentric = N Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: The null result is consistent with geocentric theory. It is due to null motion of the Earth

Summary: Geocentric = S, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Fizeau, 1851

Proposal: Fizeau measured the speed of light in moving materials. Light was dragged through moving water; fringes observed due to motion of the water agrees with Fresnel's drag formula. No effect seen, due to the motion of the Earth, is interpreted as very strong evidence for ether dragging. The Fresnel drag coefficient is solidly established by experiments, and is consistent with Special Relativity to within experimental limits.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = S, General Relativity = N

Geocentric Response: No effect due to the Earth's motion could obviously mean that the Earth is not in motion. Why invent a counter-intuitive concept of the immovable ether being dragged by matter? If anything makes sense it would be the ether dragging matter, not the reverse. Lorentz derived the Fizeau result without using relativity; the Galilean transformation also derives it with a variable *c*. Several causes can be given for the Fizeau result.

Summary: Geocentric = S, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Hoek, 1868

Proposal: An interferometer experiment with one arm in water. Greatly improved the accuracy of Arago's experiment, replacing the telescope with a terrestrial source and a square (ring) interferometer with one side in water and three in air. The null result is consistent with Arago's result, Fresnel's drag coefficient, and Special Relativity.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: No fringe effect was seen at all, and no explanation given for a result so contrary to Fizeau's. As in many other tests, the ether's existence is rejected, instead of accepting a motionless Earth.

Summary: Geocentric = S, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Airy, 1871

Proposal: Another test for ether's presence. Does a telescope filled with water cause an image shift? Does the stellar aberration angle change if the telescope was filled with water? No! George Airy tested whether water in a telescope would cause the light to bend (refract) at a larger angle. If the Earth was actually moving, the beam should deflect more; if the starlight were moving, there should be no change.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = N, General Relativity = N

Geocentric Response: Another false disproof of Geocentrism – Airy's failure showed deflection happened outside the telescope: (1) Due to the ether in space between Earth and star, (2) The deflection originated in the source => the stars inherently move in aberrant ellipses. So the star was moving and not the Earth. "Airy's failure" failed to prove that the Earth revolves about the Sun. No evidence compels us to believe the Earth is spinning.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = N, General Relativity = N

Michelson-Morley, 1887

Proposal: In 1880 Maxwell hinted the absolute velocity of Earth in the "luminiferous ether" that carried electromagnetic phenomena may be optically detectable. Michelson-Morley tried to detect the motion of the Earth through an absolute space – the ether. The famous null result was interpreted as showing a single "universally fixed" ether does not exist; either space moves with the Earth (ether drag), or there is no ether. Stokes' dragging became the standard model. The failure became significant in promoting the acceptance of Einstein's theory of Special Relativity, that physics laws only require the motion of the Earth relative to other matter, not relative to an ether.

Summary: Geocentric = D, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: The null result includes the rational option of the Earth being at rest. The refusal to even consider the possibility that this was true, and that Galileo and all science for centuries had been wrong, disproves the posture of modern science being objective. Even the null result wasn't really so, as Miller and others showed in later tests. There were daily and annual variations that have great importance for geocentric theory, as we shall see.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = N

Oliver Lodge, 1892

Proposal: In response to ether drag/entrainment, Lodge noted that the effect is undetectable around rapidly moving celestial bodies like planets. He verified experimentally that even in very close spaces the ether is not entrained by its surroundings when they are put into rapid motion.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: Geocentric theory of the ether includes the slight drag of free particles (gases) in the ether flow. Ether drag by matter is rejected as confusing cause and effect. So the Lodge experiments do, indeed, support Geocentrism.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = D

Trouton-Noble, 1903

Proposal: The Trouton-Noble experiment attempted to detect motion of the Earth through the luminiferous ether. This classic experiment is regarded as the electrostatic equivalent of the Michelson-Morley optical experiment, though achieving the necessary sensitivity may be impossible. It looked for a torque induced on a charged capacitor due to its motion through the ether. Its null result is consistent with Special Relativity.

Summary: Geocentric = D, Heliocentric = S, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: The effect of ether flow on charges bound in a solid is most likely undetectable, based on studies by Cahill on the need for gases with enough degrees of freedom to respond to the motion. To be compliant with the Miller comment on the Michelson-Morley experiment, this experiment is best done at altitude in the open. As an ether test, this experiment is a non-starter.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Trouton-Rankin, 1908

Proposal: Spelled the end of the Lorentz-Fitzgerald contraction hypothesis by achieving an incredible sensitivity. Regarded as the electrical equivalent to the Kennedy-Thorndike experiment, it was designed to measure if the Lorentz-Fitzgerald contraction of an object in the absolute ether produced measurable effects in the object's rest frame. This test showed that, if the Lorentz-FitzGerald contraction existed, it was not measurable in the rest frame of the object.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D
Geocentric Response: Geocentrism is rooted in reality; the results are what are expected. There is no need of mystical contraction of matter in the direction of motion, with no explanatory physical mechanism. The mystery is why anyone would reject a static Earth in favor of the bizarre Lorentz contraction hypothesis.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Zurhellen, 1914

Proposal: Binary star observations determine that the speed of light is not dependent on movement of the source to 10^{-6}. This is evidence against ether drag if each binary component has its local ether shell with its alternating effect on *c*. Also, shell distances are minute compared to star-Earth distances. Evidence for the lack of longitudinal additions to the velocity of light by the radial motion of the source.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = S

Geocentric Response: No, ether drag supports Geocentrism. Special Relativity predicts an active aberration effect produced by the motion of the source in its rest frame, the barycenter of the binary system. Bradley aberration is caused by absolute motion of the Earth around the sun. Yet standard physics attributes aberration to their relative motion, supported by exclusive authorities such as Einstein and Pauli. This experiment fails to support relativistic predictions for transverse motion of the source.

Summary: Geocentric = S, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Kennedy-Thorndike, 1932

Proposal: Kennedy-Thorndike used an interferometer with arms of different lengths and not at right angles. A null result is obtained, consistent with Special Relativity, implying length contraction and time dilation. Apparatus was fixed to the Earth, forcing co-rotation. No diurnal or seasonal variation was seen. Also a Special Relativity test to verify time dilation: no phase shifts will be detected in Special Relativity while the Earth moves around the sun, while such would result from length contraction alone.

Summary: Geocentric = D, Heliocentric = S, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: Special Relativity is verified because time stretches and lengths contract to produce the null? A better option is *terra immobila* and ether flow, with no wild speculations about space and time needed. With the Trouton/Noble test, Kennedy/Thorndike eliminated Lorentz contraction as a viable option. The test was doomed at the start by bad choices: enclosing the equipment from the ether, and, fatally, using a vacuum interferometer that precludes an ether-matter interaction. With such fundamental faults, Kennedy/Thorndike should be ignored.

Summary: Geocentric = S, Heliocentric = D, Ether = N, Special Relativity = D, General Relativity = D

Hamar, 1935

Proposal: A complete Michelson-Morley experiment with one of the interferometer arms placed between two massive lead blocks. If ether were dragged by mass, the blocks would cause a visible effect. Ether dragged by the mass was not detected; again the null result was found.

Summary: Geocentric = D, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: The ether was already reduced by the building housing the laboratory; additional partial shielding would not be measurable. The theoretical principle is sound, but it should have been done outside, so that ether could be measured with and without the lead blocks

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = N

Townes, 1958

Proposal: Townes, one of the co-creators of the first maser, replaced the light source in the Michelson interferometer with a ruby maser and repeated the Michelson-Morley experiment. The upper limit on drift, including any possible experimental errors, was only 30 m/s = $10^{-7}c$

Summary: Geocentric = D, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: The faults of the Michelson-Morley experiment remained – The criteria of Miller for a high and unobstructed location and of Cahill for a refractive gas.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = N

Frisch-Smith, 1962

Proposal: Shows that radioactive decay of mesons is slowed by motion. Mesons live longer by time dilation – a confirmation of Special Relativity.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response:

- Time dilation is common to many alternate theories
- It neither proves Special Relativity theory uniquely nor conflicts it.
- Special Relativity theory is not applied correctly in the analysis, since Lorentz contraction is ignored.
- Other tests show Lorentz contraction doesn’t exist.
- If time dilation is true, the best current thinking of Geocentrism is the S gauge scale factor of Hatch.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = D

Trimmer, 1974

Proposal: The first ***c*** test with lasers. Repeats Michelson-Morley experiment with accurate lasers and a triangle replacing the square Michelson-Morley path. Included tests of entrainment by placing one leg in glass. Ether drift now reduced to 0.025 m/s = $10^{-11}c$

Summary: Geocentric = D, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: The laser only reduced the probability of ether detection. Use of vacuum or solid media in the optical path violates the gas media requirement.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = N

Brecher, 1977

Proposal: Repeats 1914 Zurhellen experiment with X-rays from binary pulsars. For x-rays and gamma rays, the extinction distance is much larger than the distances to many binary star systems, allowing a test of DeSitter's proposal. Observations put a limit on the source-velocity dependence of $c < 2 \times 10^{-9}$.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: Other than the extinction test and use of high energy electro-magnetic waves, the results mirror prior testing with light. See Zurhellen 1914.

Summary: Geocentric = S, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

DePalma Spinning Ball Drop, 1977

Proposal: DePalma took two steel balls and catapulted them into the air at equal angles, with an equal amount of force. The only difference was that one ball was rotating 27,000 times per minute and the other was stationary. The rotating ball traveled higher into the air and then descended faster than its counterpart, which violated all known laws of physics.

Summary: Geocentric = N Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Geocentric Response: Mainstreamers usually ignore this effect, or ridicule its violation of the laws of Newton and Einstein. With so few investing time to verify and understand the effect, its location in the physics closet is understandable. Primitive ether theories now proposed will no doubt be improved, but more eyes and minds are needed, not abuse from the paradigm-huggers.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Gyro Drop, 1977

Proposal: Observations of interaction of gravitational and inertial forces on a falling gyroscope reveal a slight enhancement of inertia by the gravitational field. A rotating mass will fall more rapidly, with greater acceleration than an equivalent non-rotating mass.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Geocentric Response: Further support for the DePalma spinning ball results.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Quantum Redshifts, Tifft, 1984

Proposal: Tifft found that galaxy red shifts take on preferred or quantized values. Analogous to the energy levels within atoms, there was a periodic grouping of galaxy red shifts around discrete values across the span of the universe.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Geocentric Response: There are no modernist cosmology theories that can account for this architecture of the universe around the Earth, one of the simplest and strongest proofs of geocentrism.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = D

Redshift Anomaly, 1990

Proposal: The annual change in Doppler shifts we see in stars near the ecliptic is one proof that Earth orbits the sun; the wavelengths go back and forth each year, changing slightly to red as we move away from a star and then to blue when we're on the other side of our orbit moving toward the star.

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: Is this an urban legend? Where is the data? No references are given for the significant detailed sky survey required, nor can one be found by research. More significantly, by mathematically subtracting the Earth's motion, the reverse effect is accomplished. If the Earth is actually at rest, the "heliocentric correction" will corrupt the data with false motions of rotation and revolution. The red shift anomaly is a paragon of false reasoning – fixing something that isn't broken!

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Cosmic Megawalls, 1990

Proposal: The universe is crossed by at least 13 vast 'walls' of galaxies, separated by about 420 million light years, according to researchers. The walls are spaced in a very regular way that current theories of the origin of the universe cannot explain.

Summary: Geocentric = N, Heliocentric = D, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: The same inference can be drawn here as with the Tifft red shift quantum, except the scale is much bigger. The inference?

The Earth is enclosed by shells of galaxies and is the focus of the universe. The same weakness is also present here – reliance on the Hubble law.

Summary: Geocentric = S, Heliocentric = D, Ether = N, Special Relativity = N, General Relativity = N

Hils-Halls, 1990

Proposal: Repeat of the Kennedy-Thorndike and Brillet-Hall experiments, with lasers fixed to the earth for better stability. Found there was no shifting > 2 × 10^{-13} m/s. Year long observations put a limit not only on anisotropy, but also on variations in different inertial frames and universal motions. No annual variations of the round-trip speed of light were found in different directions or for the different inertial frames occupied by the Earth.

Summary: Geocentric = D, Heliocentric = S, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: As with Brillet-Hall, the experimental precision means nothing if ether detection is eliminated by use of a vacuum path. This is a protocol defect common to most modern ether tests – the vacuum interferometer.

Summary: Geocentric = S, Heliocentric = D, Ether = NA, Special Relativity = D, General Relativity = D

Mirabel-Rodriguez, 1994

Proposal: In 1994, a galactic speed record was obtained with the discovery of a superluminal source in our own galaxy, the cosmic X-ray source GRS1915+105. Several blobs were seen to expand in pairs within weeks by about 0.5 arc seconds.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Geocentric Response: An unanswered challenge to the constant ***c*** of Special Relativity, coming from our own galactic neighborhood. No excuse here for the distortions caused by deep space. The relativity explanation is typical – *ad hoc* and contrived.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Binary Star Precession, 1995

Proposal: A key proof of General Relativity theory is the excess perihelion advance of Mercury. Each century, Mercury's orbit precesses 43 arcsec farther than Newton's equations predicted. Einstein's calculations, using General Relativity theory, accounted for the excess precession, matching the observations exactly. The effect was caused by Mercury's motion through the spacetime curved by the sun.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = D

Geocentric Response: General Relativity fails the precession test outside the solar system. It predicts precessions about double the measured precessions. General relativity can hardly be general, if it only predicts orbital precession in the solar system, but fails for binary stars. Even the solar system proofs for General Relativity have always been subject to controversy, searching for proof below the experimental signal-to-noise level. A slight asphericity in the sun's shape can cause the observed precession with only classical physics.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = D

Aspden Effect, 1995

Proposal: This experiment involved a gyroscope whose wheel was highly magnetic. The energy required to spin up to maximum speed was 1000 joules. For up to 60 seconds after the gyroscope stopped rotating, it would take ten times less energy to return it to the original velocity, only 100 joules. Aspden's gyroscopes would retain their hidden energy for a full 60 seconds. Ether energy flowing through a magnet is the Aspden effect.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Geocentric Response: Another experiment denied by modernists, connecting ether to rotation. Like a glass of water being stirred up with a spoon, the rotation of the gyroscope would cause the ether in the flywheel to spiral, to continue inside the wheel even when the gyroscope was stopped. The torsional ether energy is harnessed by the powerful magnetic flywheel. That there are frauds and charlatans involved in the ether/free energy enterprise is undeniable, but how does that differ from mainstream science?

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Marinov Plasma Tube, 1996

Proposal: A cylindrical magnet is cut along an axial plane and one half is turned upside-down (the magnetic forces themselves do the rotation). Around this magnet is a trough filled with mercury in which a copper ring floats. A current from the battery causes the ring to rotate. Working either as a motor or a generator, there is no opposing torque to the direction of rotation. While power is drawn from it, it will power itself.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Geocentric Response: Another experiment tapping into the torsional energy of the ether. What is lacking is an integration of all these ether/free energy results into a coherent ether model.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Casimir Effect, 1997

Proposal: The attractive force between two surfaces in a vacuum was demonstrated by Hendrik Casimir over 50 years ago**.** Two mirrors facing each other in empty space are mutually attracted to each other by the vacuum electro-magnetic field. The Casimir effect is due to resonance of all-pervasive energy fields in the intervening space between objects. Since the Casimir force falls off rapidly with distance it is only measurable for small separations; it’s the most famous mechanical effect of vacuum fluctuations.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Geocentric Response: The ether can account for the Casimir effect by recalling the shielding effect displayed in Michelson-Morley type experiments. Greater ether density outside the mirrors than inside would force them together – an ether-based Casimir force. No quantum vacuum is required, only the ether properties already discovered.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Magnetic Memory, 1997

Proposal: Donald Roth discovered that, after first placing a fixed magnet close to a hanging magnet to attract it, then moving the magnet much farther away from the hanging magnet after five days, the magnet still attracted the hanging magnet the same way. This simulation of memory and amplification by ether is known to the Russians as "vacuum structuring."

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Geocentric Response: This shows another face of the ether –

- a relationship with magnetism.
- a retention of magnetic locations.
- the ability to redirect ether flow.
- the ability to intensify magnetic effects.
- proof that magnetism is a movement of energy outside the magnet itself.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Wang Superluminality, 2000

Proposal: Lijun Wang shocked the scientific community in 2000 with the results of a one-way speed of light test that measured propagation speeds of 310 ***c*** by supplementing and extending prior quantum tunneling experiments. Light pulses were accelerated to up to 300 times their normal velocity of 186,000 miles per second. In his test interpretation light will arrive at its destination almost before it has started, leaping forward in time and severely violating causality. Special Relativity's postulate of constant ***c*** is disproved, if the experiment is valid.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Geocentric Response: Six years before, superluminal speeds were found in double galaxies. Now the same is found in terrestrial lab tests. This is one more step in the decline of Relativity and the ascent and restoration of Geocentrism.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Holger-Müller, 2002

Proposal: Promoted as the most precise experimental test to date of one of Special Relativity's central principles of ***c*** isotropy, the same value in every direction. This modern Michelson-Morley experiment using optical resonators found that Special Relativity theory passes with flying colors: ***c*** does not depend on its direction to within 1.7 parts in 10^{15}, a precision about three times better than the best previous experiment.

Summary: Geocentric = D, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: Miller's results, which suggested that in order to detect anisotropies in the speed of light, the interferometer needed to be surrounded by as little matter as possible, and located at a high altitude, were ignored in subsequent tests of the isotropy of the speed of light. Müller would have benefited greatly by recalling the experiment of Miller.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = N

Quasars in Galaxies, 2003

Proposal: One Big Bang tenet takes red shift proportional to distance, *i.e.*, the larger the red shift, the farther the object must be. Another Big Bang belief is that red shift measures velocity, *i.e.*, the larger the red shift, the faster it's receding from us.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: Galaxy NGC 7319 has an embedded quasar that is visually in front of it, but far behind it, according to the Big Bang's Hubble law. What are you going to believe, scientific speculation on the cause of red shifts or your own eyes?

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Redshift Survey Surprises, 2002-2006

Proposal: A redshift galaxy survey maps a sky section to measure the redshift of objects within the section. Applying Hubble's law to the redshifts allows conversion of the data to distances from Earth. Adding angular position data maps the 3D distribution and large-scale structure of the visible universe. The Great Wall, a huge complex of galaxies over 500 million light-years wide, dramatically illustrates what redshift surveys can detect.

Summary: Geocentric = N, Heliocentric = D, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: Not so dramatic, if the Hubble law's weaknesses are considered. Sloan shows hundreds of super clusters and "Great wall" structures. Huge clumps and dark voids stretch out along our line of sight from Earth; galaxies line up in filaments pointing at us – the "fingers of God". The simplest answer is to discard the Hubble formula and find a reliable distance indicator.

Summary: Geocentric = S, Heliocentric = D, Ether = N, Special Relativity = N, General Relativity = N

Gamma Ray Bursts, 2006

Proposal: Gamma-Ray Bursts (GRB) are uniformly distributed across the sky, not along the Milky Way plane. They originate far outside of the Milky Way galaxy with enormous energies, detectable across the entire observable universe. Gamma Ray Bursts come from the hottest, fastest, densest, or most powerful objects ever seen. A burst will last anywhere from 0.01 to 1000 seconds, the brightest source in the gamma-ray sky, sometimes brighter than the whole gamma-ray sky! Gamma Ray Bursts occur randomly in time and sky direction. Gamma Ray Burst energy is channeled into narrow jets, detected only if aimed along our line of sight. The energy output is 10^{43} watts — 1,000 times brighter than quasars and one hundred quadrillion times more intense than the sun.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: The remote distances, if true, imply Earth is the Gamma Ray Burst focus. GRB's are so intense they could easily be seen even deeper in space, but they are not seen. They mark the boundary of a finite universe. Hubble's law is used to place Gamma Ray Bursts in deep space, but their distance (and energy) are greatly overestimated. Arp's studies discredited the Hubble law: the Gamma Ray Bursts are not as far and energetic as first believed. No after glows are seen without seeing Gamma Ray Bursts first, implying GRBs are not focused in a beam.

Summary: Geocentric = S, Heliocentric = D, Ether = N, Special Relativity = N, General Relativity = D

Gravito-Magnetic London Moment, 2006

Proposal: Just as a charge in motion creates a magnetic field, so a moving mass generates a gravito-magnetic field. In Einstein's General Relativity, this effect is negligible. But this experiment finds otherwise – the effect is much larger than General Relativity expects.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = D

Geocentric Response: Two elements should grab our attention in modern experiments: magnetic fields and rotation. Past items in this chapter have shown that a torsional ether field produces anomalous effects when the two factors above are present. It is too early to venture a complete ether theory; more experimental conditions need to be explored. But this experiment will probably be one of the key tests in cracking the code of the ether.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = D

Polar Ice Caps

Proposal: If the sun revolved around the Earth every 24 hours, it would melt the polar ice caps.

Summary: Geocentric = D, Heliocentric = S, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: An argument heard from the newly or poorly instructed in physics. Apparently the geocentric model means the sun circles only the equator, oblivious to the fact that the geocentric model is what is seen from Earth! The angle made by the sun on Earth is the same in both models, independent of which is moving.

Part 3: Does the Sun-Earth System Move through Space?

There are 3 modernist anti-geocentrism claims:

(a) The rotation of the Earth
(b) The revolution of the Earth around the sun
(c) **The sun and Earth participate in the straight line motion of the celestial clusters**

This section covers the claim that the Earth is moving in a straight line as part of some cosmic group: the solar system, the Milky Way galaxy, the Local Group of galaxies or some higher group.

We start with the Sagnac experiment which first established relative ether motion. The experiments continue up to the latest discoveries based on laser interferometry and analysis of the Cosmic Background Radiation spectrum.

Key ether drift experiments have been revisited by:

- Munera (1998)
- Cahill (2000)
- Allais (1970-2003)
- Galaev (1998)

For experiments not performed in vacuo or with a solid transparent medium, further analysis shows three common features:

1. the definite existence of the ether ➔ non zero fringe shift
2. motion of the ether at less than 10 km/s, from the raw data
3. motion of the ether at less than 10 km/s, from the raw data
4. the direction of the ether flow perpendicular to the ecliptic (the orbital plane of the Sun and planets)

The experimental results are typically cast as “null,” since the scientists were seeking a phantom – an orbital velocity of 30 km/s, when there is no orbit for Earth. The most recent series are those conducted in the Ukraine, using microwaves (1998/99) and optical interferometer methods (2001/2002) (Galaev).

OWLS vs. TWLS

A two way light speed (TWLS) test occurs when light has to be reflected back on itself to complete a measurement over a set distance. This masks any anisotropy effect by making it a second-order test of v/c. The Michelson-Morley experiment requires sufficient precision to sense $(v/c)^2$, but a one-way (OWLS) test would be first-order and involve sensing v/c.

Vacuum Interferometers

Vacuum-mode interferometers have found increasing popularity in modern experiments. Their consistency in obtaining null results for ether drift detection and thus supporting Special Relativity theory may be one of the reasons for this. No one (except Cahill) seems to have asked why gas interferometers consistently detect small speeds of 10 km/s or less, while vacuum versions find no ether motion. An absolute reference frame is indicated by gas interferometers. A theory explaining this must embrace refraction effects to be successful.

Solid Medium Interferometers

The value of refractive index n in transparent solids is much greater than in gases, leading to the obvious consideration of using solid-state fibers as the light path medium in interferometry. But this extension overlooks the most significant difference between gas and solid – the degrees and types of kinetic freedom. Gas has the most freedom and least resistance to ether effects, as already seen. But atoms in a solid lattice are restricted severely to modes of material vibration about a cell center. We would expect from this (crude) reasoning that light speed would not be affected as much, or at all, compared to propagation of phonons in the transparent fiber. Null results for light speed changes are the theoretical expectation, but a clever experimenter should be able to devise a test for changes in phonon speed or wavelength that are induced by the ether motion. Until a valid theory for ether effects in solids is developed, or more sensitive technology, solid medium tests will have the same status as the vacuum type of interferometry – ineffective for measuring ether drift.

Dayton Miller

To test the ether drag hypothesis, Miller repeated the Michelson-Morley experiment by moving it from a Cleveland basement to higher ground on Mount Wilson, where ether drift should be stronger. Miller’s data was far more precise and prolific than the Michelson-Morley experiment. His larger apparatus used a 50x telescope, allowing magnified readings down to hundredths of a fringe, though readings were typically recorded in tenths. To detect anisotropies in the speed of light, the interferometer needed to be surrounded by as little matter as possible, and located at a high altitude – a precaution ignored in many modern ether tests, such as the Brillet-Hall and Müller experiments. Detection of an ether wind was virtually impossible if it was almost completely blocked out by surrounding structures like the laboratory walls or the apparatus itself. To avoid the ether wind being blocked by solid walls, he used a special shed with thin walls, mainly of canvas. Miller argued that basement locations, or interferometers shielded with opaque wood or metal housings, yielded the most tiny and insignificant effects, while those undertaken at higher altitudes and in less dense structures yielded more readily observable effects.

Michelson-Morley versus Miller

A total of over 200,000 individual readings were made, from over 12,000 individual turns of the interferometer, undertaken at different months of the year, starting in 1902 and ending in 1926. The Michelson-Morley experiment of 1887 involved only six hours of data collection over four days with only 36 turns of their interferometer. Even so, Michelson-Morley originally obtained a slight positive result that has been systematically ignored or misrepresented by modern physics. The Michelson-Morley experiment was performed in a basement, violating almost all of Miller’s rules for ether detection and avoiding material dragging. Miller thought shielding of the apparatus by this interior location slowed down the movement of the ether. A small but practically “null” result for any similar Michelson-Morley type was virtually guaranteed. Michelson and Morley’s “null” result appears to have been conducted in ignorance of Miller’s work and protocol caveats. They seem to have been unaware of Miller’s conclusion that the ether wind can best be detected in the open.

Miller’s analysis showed that the Michelson-Morley experiment did, in fact, contain a systematic sine wave of readings as expected of an ether drift. The commonly accepted null result is only arrived at by assuming a specific direction for the ether wind, combined with disregard for thermal effects. When daily temperature drift is factored out and no wind direction assumed, the 1887 Michelson-Morley experiment shows a fringe shift approximately equivalent to the 10 km/s found in Miller's experiments. Concerning the Michelson-Morley experiment Dayton Miller concludes that:

> The brief series of observations was sufficient to show that the effect did not have the anticipated magnitude. However, and this fact must be emphasized, the indicated effect was not zero; the sensitivity of the apparatus was such that the conclusion, published in 1887, stated that the observed relative motion of the earth and ether did not exceed one-fourth of the Earth's orbital velocity. This is quite different from a null effect now so frequently imputed to this experiment by the writers on Relativity.

Geocentric Response

Miller consistently measured a small positive effect that varied with each rotation of the device in a sidereal day and on a yearly basis. This effect was only ~10 km/s instead of the expected ~30 km/s from the Earth's orbital motion through a rigid stationary ether. The reduction was attributed by Miller to partial dragging of ether. The Fitzgerald-Lorentz contraction derived from Special Relativity invariance of ***c*** was consistent with the apparently null results of most Michelson-Morley experiment types, but not with Miller's observed seasonal effects. Miller's concern about the experiment's ambient conditions was justified, but not because ether was dragged by the environment.

In Geocentrism:

1. The Earth doesn't move in the ether vortex surrounding it
2. Genesis testifies that the firmament only exists above sea level, so the Earth's surface forms its boundary.

A few years after Miller's death his work was reportedly refuted by Shankland, a personal friend and great admirer of Einstein, but recent objective work by Maurice Allais has proven the allegations false. Miller's experiments were found to have no fundamental error; observations all show a positive periodic displacement of the interference fringes, as of an ether drift. The effects were shown to be real and systematic, beyond any further question. Miller had better knowledge of these experiments than any commentator/critic. Nevertheless, the opinions of armchair scientists from the sidelines tend to be more credible than the views of those actually involved daily in the research. The current image of science is a kind of democracy where agreement signifies truth while disagreement is taken to imply incompetence, or bias, or political interference.

Einstein and Miller

Einstein personally played a part in dismissing Miller's work, knowing that supporting it would end his Special and General Relativity theories. He felt Miller's results could be dismissed as experimental error. In 1926 Miller told the press:

> The trouble with Professor Einstein is that he knows nothing about my results....He ought to give me credit for knowing that temperature differences would affect the results. He wrote to me in November suggesting this. I am not so simple as to make no allowance for temperature.

Cosmic Ether Drift

The experiments yielded systematic periodic effects that pointed to an identifiable axis of cosmic ether drift, though of a variable magnitude, depending upon the season, time of day, density of materials shielding or surrounding the apparatus, and altitude at which the experiment was undertaken. Ether properties explain all these variable dependencies. When plotted against sidereal time, they produced:

> a very striking consistency of their principal characteristics...for azimuth and magnitude... as though they were related to a common cause...The observed effect is dependent upon sidereal time and is independent of diurnal and seasonal changes of temperature and other terrestrial causes…a cosmic phenomenon.

Since the measurements were made at different times of day, and at different seasons, their amplitude would vary, but the direction of the ether-drift would shift only to the same average points along a sidereal azimuth. Measurements were latitude-dependent as well, and when analyzed, revealed a common sidereal cosmological axis of ether-drift.

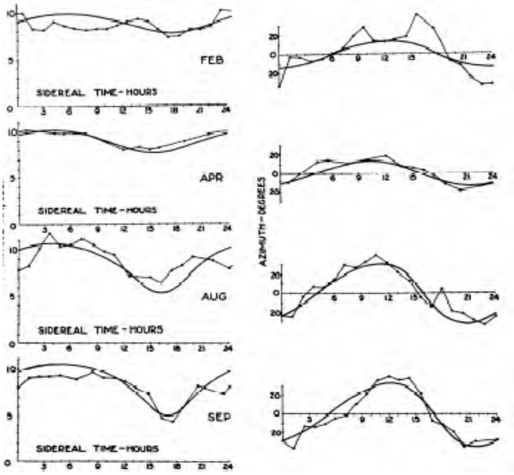
Miller concluded that the Earth was drifting at about 10 km/sec towards an apex in the Southern Celestial Hemisphere, towards Dorado, the Swordfish, right ascension 4 hrs. 54 min., declination of -70° 33’, in the middle of the Great Magellanic Cloud and 7° from the southern pole of the ecliptic. He assumed the Earth was moving through a partially entrained ether which reduced its velocity from 200 km/sec in space, to about 10 km/sec nearer to the surface. This experimental result agrees with the concept of partially entrained ether but not with Special Relativity theory.

Independent averages for the four epochs provided by Miller (February = -10° west of north; April = +40° east; August = +10° east; September = +55° east), together yield a grand mean displacement 23.75° east of north. This is very close to the Earth’s axial tilt of 23.5°, a correlation hardly coincidental.

Summary of cosmic drift results:

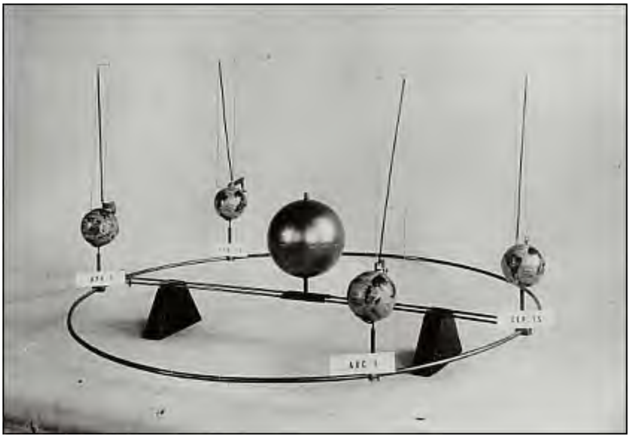
- Maximum velocity occurs at around 5 hours sidereal time and minimum velocity occurs around 17 hours sidereal.
- The movement and direction of ether drift past the interferometer was towards Draco near the northern pole of the ecliptic (17 hours RA, Dec +68°).
- Efforts to correct for mechanical and thermal artifacts never eliminated the observed periodic sidereal variations, which persisted throughout the experimental work.

Data Analysis



Periodicity of Global Ether-drift,
Dayton Miller 1925-26.

The above-left chart shows a definite periodic curve for four separate months, measured at different sidereal times. The heavy line is the mean of all four epochs. The above-right chart plots the azimuth for the same data with apparent visual periodicity. This demonstrates the detected axis and periodicity of ether drift is the same for different times of year, but is only recognizable visually in a sidereal view. There never were any periodic effects seen in civil time coordinates, as expected from daily thermal effects arising from solar heating.



Miller's Earth-Sun model, measured at four seasons, for the cosmic ether-drift axis, approximately normal to the ecliptic plane

Analysis by Maurice Allais

Maurice Allais performed a statistical analysis of the thousands of interferometer measurements of Dayton Miller and found a corresponding periodicity with the sidereal day, the equinoxes and other celestial events. According to Allais:

- Michelson and Morley results were not null, invalidating both Shankland's report and Special Relativity.
- Anisotropy of light was seen as variations in light speed with direction, implying an underlying universal frame.
- Determination of day of year was possible with terrestrial measurements – for example, in a sealed room.

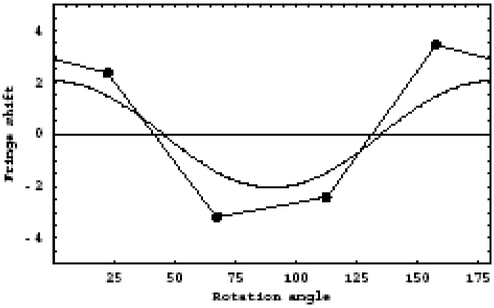
- The Earth's cosmic translation velocity had a computational error in direction.
- Fringe variations have a sidereal period.
- Fringe extrema coincide with the equinoxes.
- The data has a high confidence level and statistical significance.
- No distinction exists between Earth's rotation and translation, as Special Relativity asserts.
- Both rotation and translation are detectable.

Illingworth

Munera revisited the data, getting $V_e = 3.1$ km/s. For helium $k^2 = 0.00007$, greatly reducing sensitivity, but providing the first experiment to use a gas other than air, as was done in the Michelson-Morley experiment and Miller. The dependence on refractive index was now testable, albeit in hindsight 80 years later. The correction factor for helium is 118, so $V_{ae} = 368$ km/s, in the ballpark of the Michelson-Morley experiment and Miller ether velocities, as corrected for refractive reduction.

Joos

Joos concluded that the small interferometer fringe shift showed a speed of only 1.5 km/s. The corrected speed for fringe shift with helium refraction is 433 km/s.



Comparison of Joos data with theoretical Miller curve[322]

NB: The ether has a yearly cycle centered on the galactic North pole!

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[322] http://xxx.lanl.gov/PS_cache/physics/pdf/0312/0312 082 .pdf

Pound-Rebka

Definition: Principle of Equivalence:

Experiments performed in a reference frame with constant acceleration are equivalent to the same experiments performed in a non-accelerating reference frame in a gravitational field where the acceleration of gravity, g, equals the intensity of gravity field. This implies that the gravitational mass used in Newton's universal law of gravitation is identical to the inertial mass in Newton's second law, $F = ma$. Also, because photons have momentum, they have inertial mass and gravitational mass. Photons should be deflected when crossing radial gravity lines and impeded when moving opposite to gravity. The last implication is tested by looking for a gravitational redshift, as Pound-Rebka did.

Description:

The last of the classical tests of General Relativity to be verified in 1959. It uses the redshift of light moving in a gravitational field to test if clocks do run at different rates at different altitudes. The frequency of photons emitted by two iron (Fe^{57}) sources were compared at a fixed location twenty-two meters apart. The source was mounted on a speaker cone vibrating at 10 Hz to mechanically drive the source up and down slightly. By measuring the variation in detection rate of the Fe gamma rays while the source vibrated, the velocity difference between source and detector that compensated for the gravitational frequency shift could be found. By reversing direction to also measure the frequency shift of rising gamma rays, the difference between the rising and falling effects was measured – only a few parts in $10^{15.}$ This represented the pure gravitational effect. An ingenious experimental design.

Analysis:

According to the principle of equivalence from General Relativity, acceleration of a radiating source produces the same frequency effects as a corresponding gravity field. Thus the expected shift in radiation frequency in a gravitational field can be related to the relativistic Doppler shift experienced from an accelerating light source. The maximum source velocity v is $<< c$; the frequency of the gamma source at rest is f_0.

For a moving source the Doppler formula for detected frequency f is:

$$f = f_0(1 + v/c)$$

The time to reach the detector is:

$$t = L/c$$

and the speed is:

$$v = at = a(L/c) = gL/c$$

by the principle of equivalence. The detected frequency is now:

$$f = f_0(1 + v/c) = f_0(1 + (gL/c)/c) = f_0(1 + gL/c^2)$$

so:

$$\Delta f = f - f_0 = gL/c^2$$

The variations of v(t) affect the frequency f according to the strength of gravity g. In Special Relativity:

$$E = mc^2 = hf$$

And the gravitational potential energy at reference radius r_0 is:

$$U = -GMm/r_0$$

where f_0 is the reference frequency of the gamma rays. At altitude h:

$$U = -GMm/(r_0 + h)$$

$$= -GMm/r_0(1 - h/r_0)$$

$$\approx -GMm(1 + h/r_0)/r_0$$

At this height the difference in energy is:

$$\Delta E = \Delta U = h\Delta f$$

$$= -GMm/r_0 - (-GMm/r_0 - GMmh/r_0^2)$$

$$= GMmh/r_0^2 = mgh = h(f_0 - f)$$

f is the frequency at h, so:

$$\Delta E = mgh = Egh/c^2$$

$$= 14.4 \text{ KeVg} \times 22.6\text{m}/c^2$$

$$= 3.5 \times 10^{-11}\text{eV}$$

Comparing the energy shifts on the up and down paths gives a predicted relative difference of:

$$(\Delta e/E)\text{down} - (\Delta e/E)\text{up}$$

$$= 2(3.5 \times 10^{-11}\text{eV})/14.4 \text{ KeV}$$

$$= 4.9 \times 10^{-15}$$

The measured equivalent is:

$$(5.1 \pm 0.5) \times 10^{-15}$$

The Pound-Rebka experiment did not:

- demonstrate a constant speed of light. If ***c*** decreases by only 7.35×10^{-7} m/s in the 22 meters above the Earth, the same effect as observed would be seen in the frequency drift. This test alone cannot prove or disprove this possibility.
- show how space and time were unified.
- solve the action at a distance question - the existence of an ether or not.

The results are inconclusive; what it proved was the energy of a photon will change as a function of gravity or equally possible, as a function of the cause of gravity, *i.e.*, ether. When the change in ***c*** is calculated from the Hatch gauge scale, we find:

$$V = c\,(1\text{-}2gh/c^2)^{1/2} \approx c(1 - gh/c^2)$$

This predicts the same change in *c*, 7.35 × 10^{-7} m/s, and frequency, 4.92 × 10^{-15}, as was measured in the Pound-Rebka test, as long as the coordinate system is geocentric and “h” is measured from the surface.

Claims and Responses

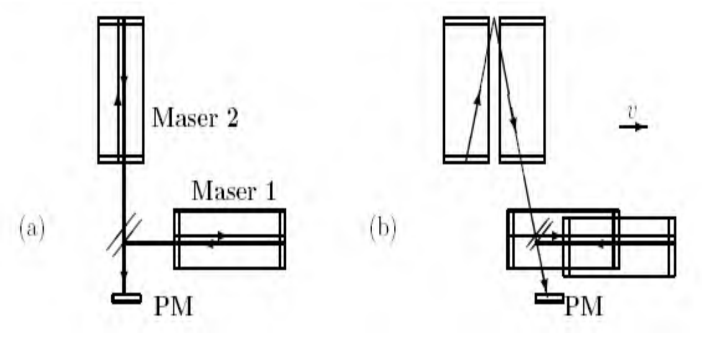
Claim #1: The gravitational interaction occurs within a four-dimensional space-time continuum that cannot be illustrated by diagrams and can only be understood in terms of very complex Riemannian geometry. Gravity causes “space-time” to curve in a way that cannot be pictured. As the photons move through this curved space, the curvature causes them to be redshifted and blueshifted.

Response: There are no experimental measurements that could serve as evidence for “the space-time continuum,” – a ruler-clock? Belief in General Relativity theory permits (and prefers) mental measurements (gedanken experiments) over physical observations.

Claim #2: Only an observer in free fall, who is weightless and feels no acceleration or gravity, is in an unbiased reference frame.

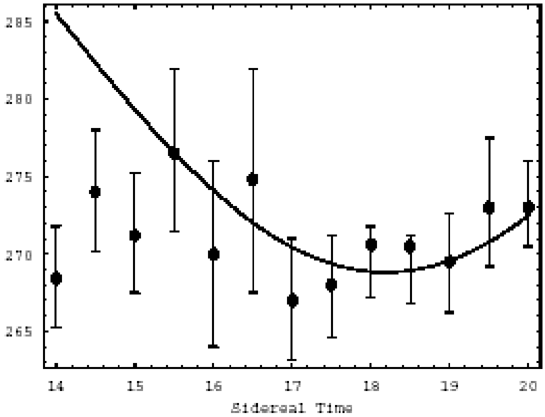
Response: This contradicts the freedom to choose the inertial reference frame of Special Relativity. If General Relativity theory requires a frame in free-fall, then it is no longer a theory of relativity but absolutivity, since all frames are not equivalent. Satellites satisfy the free-falling condition, yet GPS will not operate if the satellites are used as the time standard!

Jaseja Experiment



Layout to measure beat frequency between two optical masers: (a) both at absolute rest, (b) top in absolute motion at velocity v. PM is the photomultiplier detector.

This double maser apparatus is essentially equivalent to a Michelson interferometer, measuring the ether effect to order v^2/c^2. Rotation through 90° produced repeatable variations in the frequency difference of about 275 kHz, an effect attributed to magneto-restriction in the Invar spacers due to the Earth's magnetic field. Observations over some six consecutive hours produced a minimum in the frequency difference of about 3 kHz superimposed on the 275 kHz effect.



Frequency delta after a 90^0 rotation

Geocentric analysis

Seen above, 275 khz is the average frequency shift over time which shows a local drop of 3 khz at 18 hour star time. This is interpreted favorably with the Miller velocity direction, but caution in comparison with regard to Miller's data is warranted here, because of the small fringe size, and the adjustment for orbital velocity and sun ether flow effects. The resonant frequency *v* of each maser is proportional to the reciprocal of the out-and-back travel time. Cahill finds the difference between the frequencies of maser 1 and 2 is:

$$\Delta f = 2(f_2 - f_1)$$

In terms of the refractive index n, the rim rotation speed v and the frequency before rotation, f_0,

$$\Delta f = (n^2 - 1)f_0 v^2/c^2 + \text{higher order in } v/c$$

In Newtonian physics one neglects the refractive index effect, so:

$$\Delta f = f_0 v^2/c^2$$

similar to the classical analysis of the original Michelson interferometer. The very small size of the ether motion fringes results mainly because the n value of the He-Ne gas is very close to one.

Spinning Mössbauer Effect

The spinning Mössbauer experiments use a one-way light path to confirm isotropy of light speed. They are strong evidence in support of Special Relativity by validating the claim of isotropic light speed in every inertial frame by showing that there is no detectable ether drift in the laboratory.

Geocentric Response

Only in 2002 was the Michelson-Morley experiment principle of operation understood; its proper analysis leads to rejection of Special Relativity in support of Geocentrism. Vacuum interferometers are worthless for detecting ether drift. Only a Michelson interferometer in gas-mode can detect absolute motion.

The Mössbauer effect is both a source and detector of very precise gamma ray frequencies, making it a useful tool to directly detect an ether drift. Experimental setup consists of gamma ray source and detector on a spinning disk, with the light path across either the radius or diameter of the disk. The light direction can be reversed by switching the location of source and detector. Ruderfer gave the transit time across a spinning disk to second order in 1/c, as:

$$\tau = L/(c - V_{ae}\cos\theta)$$

$$= L/c(1 - (V_{ae}\cos\theta)/c) \sim L(1 + (V_{ae}\cos\theta)/c)/c$$

$$= L/c + LV_{ae}\cos\theta/c^2$$

Δt = the transit time
L = the distance between source and detector
c = the speed of light
V_{ae} = the local ether frame velocity
θ = the angle of the light path relative to the local ether velocity

The time derivative of τ is:

$$d\tau/dt = LV_{ae}\sin\theta\ (d\theta/dt)/c^2$$

Then:

$$\Delta f/f \approx \Delta\tau/dt \approx d\tau/dt = LV_{ae}\sin\theta\ d\theta/dt$$

which represents the change in detected frequency compared to source f

For the two cases are considered:

(1) The source located on the spinning rim and detector at the center, as done by Champeny
(2) the source located at the center and the detector on spinning edge, as in Turner-Hill

L dq/dt is the tangent speed of the rim, V_t, so:

$$\Delta f/f = V_t V_{ae}\sin\theta/c^2$$

If there is no ether drift, there is no frequency drift. Otherwise the frequency change is given by this formula. However, both Ruderfer and Hayden[323] have shown that the frequency change due to ether wind is canceled by an equal and opposite transit time effect, *i.e.*, the delay of the beam in moving from source to detector:

$$V_t V_{ae}\sin\theta/c^2$$

The bottom line: the spinning disk experiment using the Mössbauer effect is incapable of detecting any ethereal motion, as the effect is masked by another effect of motion.

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[323] Ruderfer, Martin, (1961) “Errata First-Order Terrestrial Ether Drift Experiment Using the Mössbauer Radiation,” *Physical Review Letters*, Vol. 7, No. 9, 1 Nov., p 361. Hayden, Howard C. (1992) “Rotating Mössbauer Experiments and the Speed of Light,” *Galilean Electrodynamics*, Vol. 3, No. 6, Nov.

Geocentric view

Reginald Cahill has revisited the Michelson-Morley experiment, for a fruitful re-analysis of the underlying theory. For the difference in travel time between the two Michelson-Morley legs, and explicitly including air refraction using V = c/n for the speed of light in air, he finds:

$$\Delta t = 2Lv(1 - v^2/c^2)^{1/2} / (V^2 - v^2) - 2L/(1 - v^2/c^2)^{1/2}$$

$$= 2Lc(1 - v^2/2c^2 + O(v/c)^4)n^2\,(1 + n^2v^2/c^2 + O(v/c)^4)/nc^2$$
$$-2Ln(1 + n^2v^2/2c^2 + O(v/c)^4)/c$$

$$\approx 2Ln(1 - v^2/2c^2 + n^2v^2/c^2 - 1 - n^2v^2/2c^2)/c$$

$$\Delta t = n(n^2 - 1)\,Lv^2/c = k^2Lv^2/c$$

defining the corrected $k^2 = n(n^2-1)$ to make comparison with the classical prediction of Newtonian optics that $k^2 = n^3$. For a vacuum interferometer $n = 1$, so all Michelson-Morley type experiments will never detect a time dilation! Classical theory says $n = k = 1$ in vacuum, and the time difference will be:

$$\Delta t = Lv^2/c$$

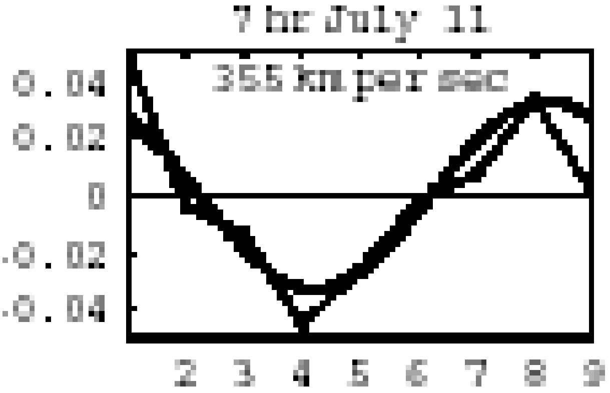
The relationship $k^2 = n(n^2-1)$ tells us that the:

- ether can only be detected with gas of $n > 1$.
- best medium for this experiment would have a high index of refraction, like chlorine in the following table.

Helium	1.000036
Hydrogen	1.000140
Water vapor	1.000261
Oxygen	1.000276
Argon	1.000281
Air	1.0002926
Nitrogen	1.000297
Carbon Dioxide	1.000449
Chlorine	1.000768
Perfluorobutane	1.0014

Index of refraction n for common gases

However, this would also increase the photon absorption and reduce the beam intensity. Cahill notes that in transparent solids a more complex phenomenon occurs; ether drift effects either do not occur in them or are not yet detectable. The index of refraction for air is $n = 1.0002926$, so $k^2 = n(n^2 - 1) = 0.0005852$, accounting for the small fringe shifts observed by Michelson-Morley. Michelson and Morley did indeed see ether-induced fringe shifts, contrary to conventional science wisdom, as analysis of their data shows. Their measured value of about 8 km/s was reduced by $k = 0.0005852^{1/2} = 0.0242$. To restore the actual value divide by k gives Vae ≈ 330 m/s for Michelson-Morley and ≈ 410 m/s for Miller's drift velocity.



Sample Michelson-Morley data after refractive and thermal drift corrections

In general, the ether velocity V_{ae} can be found from the experimental velocity V_e via:

$$V_{ae} = V_e(n(n^2 - 1))^{-1/2}$$

Recall that 8 km/s was smaller than the presumed orbital speed of 30 km/s. The updated result (after over a century!) was:

- absolute motion had been detected as fringe shifts of the correct form
- k^2 was 0, not 1, a flaw in classical theory.
- the speed of light was relative to a direction in space

It seems counter to intuition that such a small deviation from the refractive index of vacuum (such as .0002926 for air) can have such a huge effect on the detected ether speed. But it becomes more sensible when considering the exquisite optical precision of the interferometer, capable of measuring a partial wave over paths meters long.

Shapiro Venus Radar (1969)

Cyclic variations:

Already in 1961 a hint of the future periodic Cosmic Microwave Background dipole fluctuations was seen in the Venus radar data. For some reason the content has been classified by the military, so a full analysis of the motions may never be done. Is the daily cycle really sidereal and pointed, like the Cosmic Microwave Background dipole, in the direction of Leo? The question remains: is the speed of light in interplanetary space subject to systematic variations in time? This may be the start of an anomaly that just won't go away.

Shapiro proposed measuring the time delays between radar pulses sent through the sun's gravity field toward Venus and measuring the return time of the echo. Using the MIT 120-foot Haystack antenna, Shapiro conducted the test in 1966 and 1967 that confirmed radio waves slowed in the gravitational field of the sun. When the Earth, sun, and Venus are most favorably aligned, the expected time delay, due to the passage close to the sun, would be about 200 milliseconds. The test was successful.

Time delay:

In General Relativity, the travel time of any electromagnetic signal can be affected by gravitational time dilation. General Relativity theory predicts a time delay which increases when the photon passes nearer to the sun due to the time dilation while in the sun's gravity potential. Observing radar reflections from Venus just before and after its eclipse by the sun gives 5% error with General Relativity predictions.

Conflict in Findings:

Shapiro has presented the radar data as consistent with Einstein's General Relativity. Yet Shapiro admitted the published radar analysis showed very large improbable variations in the calculated value of the astronomical unit AU (the mean distance between Earth and Sun) that were far larger than the maximum estimated errors. Bryan Wallace claims all calculations by Shapiro were based on the constant ***c** of Special Relativity*; the Galilean model *c* + *v* wasn't even tested. A complete data evaluation comparing ***c*** and *c* + *v was never done,* assuming that there is nothing wrong with the Einstein General Relativity model!

When plotted, the AU contained cyclic variations: a daily component, a 30-day lunar component, and a component related to the relative orbital velocities of Earth and Venus. The daily variation was not identified as solar or sidereal. The variations fit the expectations if the speed of light was *c* + *v*, and the calculations were erroneously based on *c*. Before the 1960s, the AU had an uncertainty of as much as 170,000 miles because it was only measured by triangulation. With radar, the distance to Venus was precise to 1.5 km., the only important variable being the relative value of ***c*** in space.

A data analysis based on a constant ***c*** showed the center of Venus at different distances from Earth at the same time. Data analyzed by Shapiro's own research group also presents evidence against the constant ***c*** theory of Special Relativity using different ground stations.

Wallace's analysis of the 1961 Venus radar data showed a much better fit to the Newtonian particle *c* + *v* model than for the Special Relativity ***c*** model, but he was hampered by limited access to the full set of radar data. He wondered how the radar data can be consistent with General Relativity if there are variations far larger than possible when the observing time is changed.

Daily variations will not be evident if readings are taken at the same time each day, yet that is what the released data showed. Shapiro said ***c*** was constant based on a constant observing time and a single radar station out of three.

Wallace noted:

> The 1961 interplanetary radar contact with Venus presented the first opportunity to perform direct experiments of Einstein's second postulate of a constant ***c*** in space. When the radar calculations were based on the postulate, the observed-computed residuals ranged to over 3 milliseconds of the expected error of 10 microseconds from the best [general relativity] fit the Lincoln Lab could generate, a variation range of over 30,000%. An analysis of the data showed a component that was relativistic in a c + v Galilean sense.
>
> …JPL reported that significant unexplained systematic variations existed in all the interplanetary data, and that they are forced to

> use empirical correction factors that have no theoretical foundation.

The Russians are typically open to reporting and reacting to anomalies in existing theories. From a Soviet journal:

> … the discrepancies between the actual position of Venus and the position calculated on the basis of the existing theory of motion of the planets at different inferior conjunctions have different characters.…An analysis of the data presented shows that the differences between the measured and calculated delay times have different dependence on the time in the different conjunctions and reach 3500 microseconds, which when converted to the distance from the Earth to Venus comprises 500 km.

Supporting evidence for Wallace comes from Ronald Hatch, who finds that the NASA equations for interplanetary navigation follow his Modified Lorentz Ether Theory (MLET) rather than Special Relativity:

> There is a large disjoint between the Special Relativity theorists and the experimentalists. The Special Relativity theorists continue to claim that the speed of light is automatically the velocity ***c*** and isotropic with respect to the moving observer or experiment. But the Special Relativity experimentalists do what is necessary to explain and make sense of the measurements. The equations for tracking and navigating the interplanetary probes developed by the Jet Propulsion Laboratory (JPL) for NASA clearly follow the MLET template.

It is therefore imperative that systematic, high precision speed of light experiments be performed in Earth orbit and interplanetary space. No such experiments have been carried out yet.

Brillet-Hall (1979)

A He-Ne laser is servo-stabilized to maintain a fixed reference length using a Fabry-Pérot etalon. L is the length of the Fabry-Pérot etalon – the distance between end mirrors. The etalon and laser can rotate. The light frequency transmitted axially in that rotating frame is compared with a static reference laser. Any length change of the etalon or change in ***c*** should produce a matching change of frequency of the rotating laser, using the static stable laser as the standard reference. The test is repeated with the laser placed parallel to the Earth's motion, then at 90° to the motion. The same formulas for parallel and perpendicular transit time in an ether flow are used, but the precision is greatly improved by using monochromatic light and a precise standard. The difference in length predicted by the Lorentz contraction is tested via the servo-stabilization of the etalon length L. Brillet-Hall report a null result after rotation: no change in transit time or L.

Simplified operation:

A laser stabilized with an Fabry-Pérot etalon (a bouncing photon clock) is rotated to various positions and compared to an atomic clock's rate, a laser stabilized to a methane line.

Results:

The null results of the Michelson-Morley experiment lead to the claim of an asymmetric distortion in space and time. The aim is to verify Einstein's hypothesis that there is an asymmetric distortion of space (or matter) when the frame is moving. Brillet-Hall reported the final result as a null ether drift of 0.13 ± 0.22 Hz, which represents a fractional frequency shift of $(1.5 \pm 2.5) \times 10^{-15}$. For the orbital velocity of 30 km/sec, this result is a million times smaller than the ether model prediction. The 370 km/sec. velocity of the solar system with respect to the cosmic background radiation gives an ether model prediction 100 million times larger than the Brillet-Hall limit.

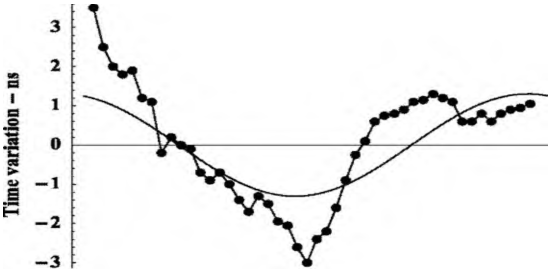
Geocentric analysis

Now accepted as an accurate confirmation of the Michelson-Morley "null" result, it seems to ignore Miller's criteria for open space around the equipment to optimize ether detection. Their bulky temperature-controlled Fabry-Perot interferometer had little chance of success. A residual 17 Hz signal (out of $\sim 10^{15}$ Hz) was thought by analysts to be due to the rotation of the Earth. Brillet and Hall only noted it was fixed in the lab frame and therefore could not be of cosmic origin. But if it was fixed in the lab frame, how could it have a 24 hour solar period?! The analysis has shown the existence of two ether drift components: (a) An annual component of size 16 m/s and period one year; (b) A larger daily 190 m/s velocity having either a solar or sidereal cycle. They made measurements every 12 hours, which means the result was phase–dependent. If the samples were taken at the zero crossings of the ether flow sinusoid, the sine wave would appear null.

Torr and Kolen (1981)

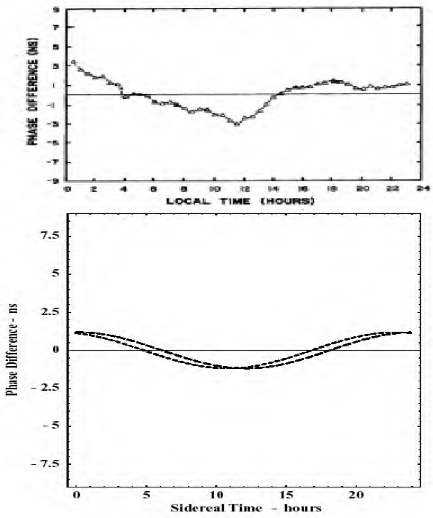
Torr and Kolen sent a 5 MHz signal along a 500-meter nitrogen gas-filled coaxial cable orientated east-west to measure the one way light speed variation. The signal was sent between two synchronized Rb atomic clocks and its phase change monitored. They inferred that ***c*** could vary in a one way measurement by as much as 1%. Phase differences of 8 nanoseconds or 0.04 wavelengths were found that had an [alleged] spurious dependence on the time of day. Analogous experiments using optical fibers give null results for the same reason, apparently, that transparent solids in a Michelson interferometer also give null results, and so behave differently from coaxial cables.

Their "null" result means that they could not sense what they were looking for, the 400 km/s motion through space as detected by the Cosmic Background Radiation, just as the "null" Michelson-Morley experiment meant that the 8 km/s reading was not the 30 km/s orbital speed Michelson-Morley were seeking. In hypothesis testing, a "null" result doesn't mean that nothing was found. There is a definite projection of the absolute motion velocity onto the east-west cable. Torr and Kolen did observe that the round trip-time remained constant within 0.0001%*c*, but variations in the one-way travel time were observed, as shown below by the data points.



Variations in travel times (ns) of an RF signal sent down a 500 m. of coaxial cable facing East-West. Predicted cosmic velocity (curve) is 433 km/s toward (5.2 hr, -72^0).

The theoretical predictions for the Torr-Kolen experiment for a cosmic speed of 433 km/s in the Miller direction (5.2 hr, -67°) and the results of the Torr-Kolen experiment are seen below to be in remarkable agreement.



Upper is experiment data for ns variation in transit time via 0.5 km E-W cable ; bottom is predicted curve for 417 km/s in the direction (RA:17:5 hr; Decl: 65°) Results are for a typical day.[324]

Torr and Kolen reported the same fluctuations in both magnitude, (1-3 ns), and time of the maximum variations in travel time, as did DeWitte a decade later, in his sentinel experiment. These one-way results are not predicted by Einstein's theory. This is another confirmation of absolute motion and a mysterious direction in space.

Silvertooth (1986)

Silvertooth used a configuration similar to the Sagnac experiment, adding a sensor capable of measuring the standing wave node spacing that is dependent upon the direction relative to the ether flow. He measured the standing waves formed by light beamed in opposite directions using two lasers. One of the lasers was phase modulated with respect to the other, creating phase conjunctions measured with a special photomultiplier detector. If the apparatus table is rotated in an E-W direction when the constellation Leo is on the horizon, there is a phase difference of 0.25 mm. When rotated 90° (N-S) the detector outputs remain in phase. The detectors also remained in phase in the E-W direction when Leo is 6 or 18 hours from the horizon. With a wavelength of 0.63 µm (He-Ne) the velocity was 378 km/s, in reasonable agreement with the Müller's results in the NASA-Ames U2 radiometer tests.

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[324] http://www.mountainman.com.au/process_physics/ HPS14.pdf Fig.16

Analysis:

This is not a confirmation of the Miller experiment because Silvertooth's velocity vector points in a different direction than did Miller's. Silvertooth also calculated a velocity of 378 km/sec, versus Miller's estimate of 200 km/sec.

NASA discovered that the motion of our solar system causes a slight Doppler shift in the spectrum of the CMB. This anisotropy indicates that the heliocentric frame moves toward the constellation Leo with a velocity of 390 km/sec, in excellent agreement with Silvertooth's findings. But Silvertooth published his results before the COBE satellite discovery.

Just as Sagnac's experiments showed ***c*** is not constant in rotating frames of reference, Silvertooth's experiment shows that ***c*** also fails to apply to light moving in a straight line. Silvertooth claimed that two way light speed tests, such as Michelson-Morley, would always cause cancellation of the velocity difference in ***c*** each way. But Cahill has shown that the refractive correction for a gas medium causes a true difference in the two opposite paths through the ether.

There are no references to Silvertooth's papers or his two experiments in the mainstream scientific literature. Unless this challenge to Relativity theory is met, the logical conclusion would be that motion can be detected by pure electromagnetic means and that Einstein's theory of Special Relativity is false.

Claims and Responses

Claim #1: The Earth moves in space with an absolute velocity. The value of this velocity (378 ± 19 km/sec) matches the independent astronomical determination of the Earth's motion relative to the cosmic background radiation (365 ± 18km/sec).

Response: The other unexpressed possibility of interpretation is that the ether is moving against the Earth, which is at rest, not the Earth moving through the ether. At all times he found a preferred direction pointing to the constellation Leo, traveling at a velocity of 378 km/sec.

Claim #2: Silvertooth's theory, method and/or data are erroneous

Response: Critics have to explain why other ether experiments sensibly measured the same velocity – speed and direction.

DeWitte (1991)

Two sets of atomic clocks in two buildings located close to a North-South line were separated by 1.5 km. Two 5MHz radio frequency signals were sent in both directions through two buried coaxial cables linking the two locations. Digital phase comparators measured changes in propagation times of the radio frequency signals in both directions for 178 days; long term drift was very linear and reproducible. The phase changes displayed a clear sinusoidal waveform with a consistent sidereal day period for the duration of the experiment.

Theory:

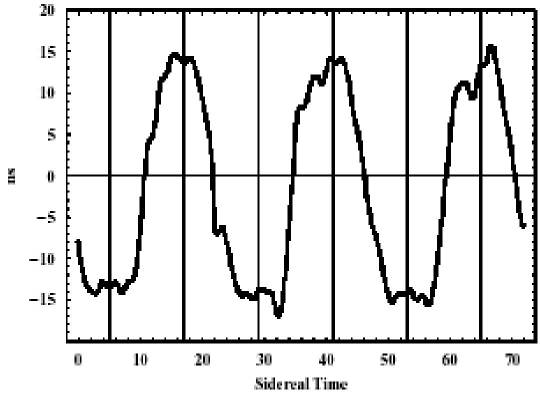
Let the projection of the absolute velocity vector **v** onto the direction of the coaxial cable be v_P. Then the phase comparators reveal the difference between the propagation times in the N-S and the reverse S-N direction. The analysis for the time difference without considering a Fresnel drag effect:

$$\Delta t = L/(c/n - v_p) - L/(c/n + v_p)$$

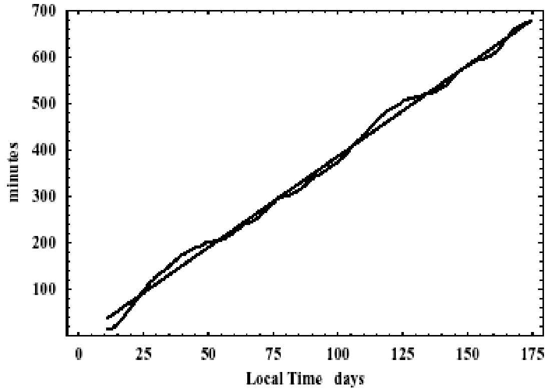
$$= 2Ln^2 v_p/c^2 + O(v_p^2/c^2) \sim 2t_0 n v_p/c$$

L= 1.5 km is the length of the coaxial cable and n = 1.5 is the refractive index of the cable dielectric, so the signal speed is about c/n = 200, 000 km/s. $t_0 = nL/c = 7.5 \times 10^{-6}$ seconds is the one-way radio frequency travel time when the horizontal ether flow $v_P = 0$. Then, for example, a value of v_P = 400 km/s would give Δt = 30ns. Being first-order in v/c, relativistic effects of second-order in v/c can be ignored. This advances experimental technique beyond the two-way light speed of Michelson-Morley type experiments.

DeWitte's new type of absolute motion experiment measured 400 km/s that, significantly, agrees with the re-analysis of prior gas interferometer tests based on the refractive index effect. Measured values of velocity V_m were corrected and properly scaled using $V = V_m(n^2-1)^{-1/2}$



Variations in twice the one-way travel time in ns, for an radio frequency signal to travel 1.5 km through a North-South coax cable. The sidereal time for maximum effect - ~17 hr (or ~5 hr) - agrees with the direction found by Miller and by Jaseja. Plot shows variation of some 28 ns over 3 sidereal days.



Drift of cross over time between max and min transit time variation plotted against the solar time for half a year. The slope of the least-squares fit is 3.92 min per day, while the difference between solar and sidereal day is 3.93 min/day.

Sidereal day:

A sidereal day measures the time for a star overhead to return to its exact position, just as a solar day is the time for the Sun to return to its position. Anything related to solar motion will generate data that synchronizes with a 24 hour day exactly, not one that is 236 seconds shorter. Because of the 4 minute difference between the two types of day, there will be 1 extra sidereal day after a year; 1 year = 365 solar days = 366 sidereal days.

Analysis:

The detected signal leads the sun by the same amount the stars do! So the time variations are correlated with sidereal time and not local solar time. The effect is certainly cosmological and not associated with any daily thermal effects, which in any case would be very small for a buried cable. Miller had also compared his data against sidereal time and found his data also tracked sidereal time and not solar time.

The sidereal dependence of the Dewitte readings is incomprehensible in the world of Relativity. A sidereal period can only be attributed to the motion of the Earth relative to the cosmos, requiring an absolute reference frame, which Einstein said does not exist. Neither Special Relativity nor General Relativity could or would ever predict a sidereal day effect.

The reaction of the physics mainstream journals has been silence, when such a paradigm-crunching discovery should objectively be making headlines on the covers. A sidereal period implies relative motion of the Earth and the universe. DeWitte detected an absolute reference frame that Einstein said did not exist.

A sidereal variation in the velocity of light means the very foundations of physics as currently believed have a fundamental error that must be corrected. A rotating cosmos would also challenge another science icon, the Big Bang. Objective science journals could have published the results, disclaiming his interpretation, unless they also could disprove his data. Since 1991 no one has analyzed DeWitte's results in the technical press or even attempted to replicate his data.

Some interpret the DeWitte data by concluding that the Earth is rotating once every sidereal day. They say he detected a second reference frame to which the Earth is subject, other than the geocentric frame itself. Whatever affects, phase shifts in copper wires with a sidereal pattern must be related to the motion of Earth in open space. But Mach's principle still holds – the Earth can just as well be at rest while the stars rotate. There is no need for a second frame. The geocentric model is an equally valid analysis of the DeWitte results.

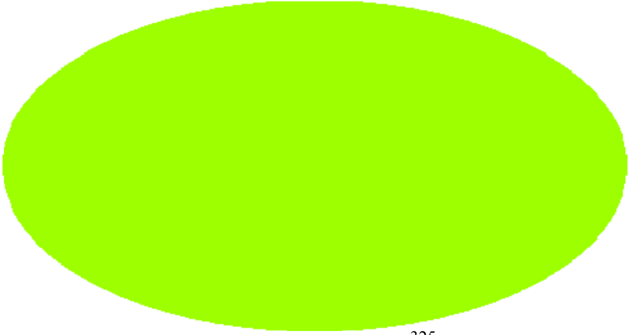
CMB dipole (1996)

The hot Big-Bang model has become the standard cosmology of modern physics. The cosmic microwave background is a 2.725 Kelvin thermal spectrum of black body radiation that fills the universe, a remnant of the birth. It is isotropic to roughly one part in 100,000; the standard deviation is only 18 μK.

The Cosmic Microwave Background radiation is a snapshot of the universe when these photons of formation last scattered. At that time the opaque universal plasma finally cooled down enough to become a transparent gas of neutral atoms. As the Universe expands it cools, and so we see the background radiation as microwaves, coming from all directions. The Cosmic Microwave Background served as a cosmic Rosetta stone, for those days 13 billion years ago.

The mapping of the Cosmic Microwave Background was expected to reveal the small random temperature variations caused by star and galaxy formation 300,000 years after the expansion began. Analysis of the COBE data by Smoot et al., exposed a large (relative to the 2.725° K monopole) anisotropic dipole amplitude of 3.358 milliK, assumed to be due to our velocity with respect to the Cosmic Microwave Background. Good agreement with the DMR and FIRAS dipole results was evidence that the COBE dipole detection was not due to systematic uncertainties in the equipment.

COBE temperature graphics



The CMB monopole[325]

The CMB's original temperature map of the sky showed a remarkable universal smoothness, a constant temperature of $T_0 = 2.725°K$, symbolized by gray (green) above.

In 1992, satellite telescopes (*e.g.*, COBE), 500 times more sensitive than prior telescopes, revealed a faint pattern in the CMB sky spectrum when viewed from galactic coordinates, as shown below.

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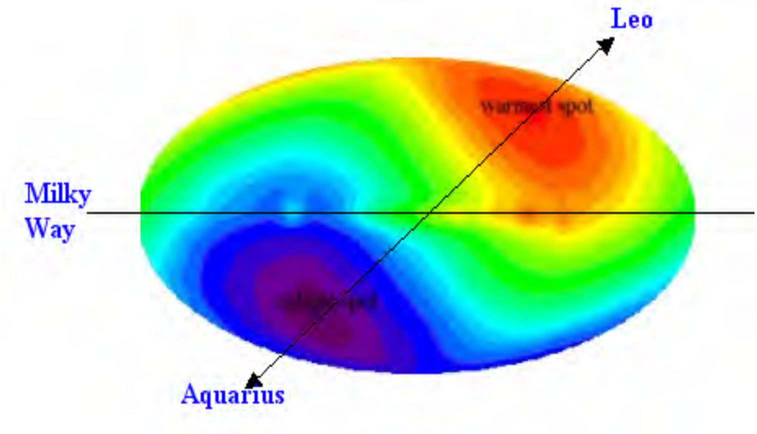
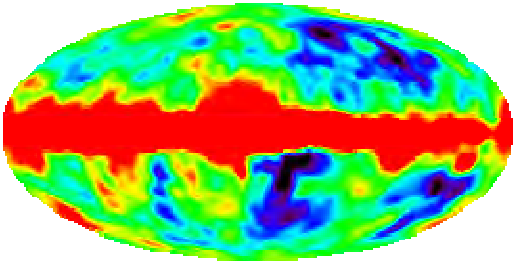
[325] http://map.gsfc.nasa.gov/ContentMedia/dmr_0_s.gif



The CMB dipole[326]

A dipole anisotropy was now seen, with the hot pole in red in the direction of Regulus, and the cold pole in purple at lower left in the opposite direction. The red part of the sky is hotter by (v/c) × T_o, while the blue part of the sky is colder by the same amount. The inferred velocity is v = 370 km/sec, the velocity of the solar system relative to the observable universe. The direction is (RA: 11hr. 12mn. Decl: -7.06°). Radiation in the Earth's direction of motion appears blueshifted (higher frequency) and hotter, while radiation on the opposite side of the sky is red shifted and colder. The Local Group moves at about 600 kilometers per second relative to this primordial radiation, a high speed that was initially unexpected - its magnitude and direction are still unexplained.



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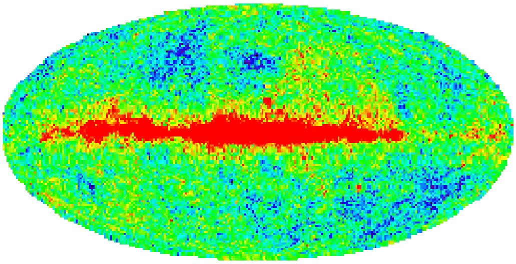
[326] http://map.gsfc.nasa.gov/ContentMedia/dmr_1_s.gif

CMB sky minus the dipole[327]



The full CMB sky at high resolution[328]

The full map of the sky is shown above, including all mK fluctuations. The Milky Way is located at the equator in this galactic reference system. The color details are tiny temperature differences of an incredibly even microwave radiation filling the universe, now at a frigid 2.73 degrees above absolute zero temperature. A high resolution view of the temperature details is shown below, with slight temperature fluctuations which vary by only millionths of a degree.

Geocentrism Outline

The Cosmic Microwave Background is considered the most conclusive piece of evidence for the Big Bang by current cosmology. It is the isotropic radiation bath that permeates the entirety of the universe. Accidentally discovered in 1964, it was soon determined that the radiation was diffuse, emanated uniformly from all directions in the sky, and had a temperature of approximately 2.73 Kelvin. It is now explained as a relic of the evolution of the early universe.

In the Big Bang theory, as the universe expanded and cooled, there came a point when the photon radiation decoupled from the matter. The radiation cooled and is now at 2.73 Kelvin; it matches the blackbody curve for that temperature very closely. Although it is considered to be unequivocal proof for the so-called Standard Big Bang model, in actuality:

- This is another example of the ‘effect implies cause’ logical fallacy: if a cause *C* produces an effect *E*, then *E* does not necessarily produce *C*. In other words, finding one cause for an effect does not exclude other possible causes for the present 2.73° K temperature.

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[327] http://map.gsfc.nasa.gov/ContentMedia/dmr_2_s.gif

[328] http://map.gsfc.nasa.gov/ContentMedia/map_model _2_s.gif

- The parameters of the Big Bang model can be adjusted to fit any temperature. The predicted temperature was as high as 50° K before the Cosmic Microwave Background discovery. The claim of uniqueness would be impressive if stated before 1964, and after the parameters had been chosen.

Abuse of the Doppler effect

The Doppler effect holds for either source or observer (or both) in motion, a phenomenon truly based on relative motion. Relativity supporters abuse this simple fact when interpreting the Cosmic Microwave Background dipole as motion through space in Leo's direction by the:

- Earth
- Solar System,
- Galaxy,
- Local Group of galaxies or
- Some other arbitrary celestial grouping.

.

For if the Cosmic Microwave Background dipole arises from the Doppler effect, as claimed, it can just as well be taken that the cluster around Regulus is the source of the motion, approaching Earth. The choice of Earth moving toward Regulus is one of many options of relative motion allowed by the Doppler theory. It is ironic that a Geocentrist has to point out to Relativists that they are abusing a principle based on relative motion, by ignoring the valid geostatic option.

Claims and Responses

Claim #1: Although the universe as a whole has no center and no edges, our observable universe's edge is the cosmic microwave background. We are moving (slightly) with respect to that edge.
Response:

1) With no edges the universe would be infinite and unchanging, as only finite things can change. If an infinite universe changed, it could not have been infinite originally. We are surrounded by change/motion, so the universe cannot be infinite.
2) If the universe has no edges how can the Cosmic Microwave Background be the edge - an edge that doesn't exist?

3) General Relativity models claim that the Big Bang universe is expanding into nothingness, an expansion not into space but creating space as it expands. This space curves back on itself so there is no center or edge (NB: I hope that's clear to everyone). There is no experimental proof of this model, created from nothing by very fertile imaginations.
4) Big Bang interpretation notwithstanding, our speed relative to the Cosmic Microwave Background is nowhere near the speed of light, and so we must be very close to the expansion center. Even the Big Bang shows the universe to be geocentric!

Claim #2: The Cosmic Microwave Background could only have arisen from the very hot, dense conditions that existed in the early Universe.

Response: There are many logical sources for a universal background of electromagnetic radiation described in cosmology literature, some from the period before the Big Bang model was promoted, some from explanations of Olber's paradox. The principal counter argument is based on the scattering of the light produced by all the universe's stars. Over time the scattered waves would be reduced to 2.7° K, the temperature of the universal container, which Geocentrists apply to the water above the firmament (Genesis 1:6-9).

Claim #3: The 3mK dipolar temperature variation across the sky arises from the motion of the solar system with respect to the rest frame defined by the Cosmic Microwave Background.

Response: (1) If the Cosmic Microwave Background fills the universe then its rest frame must be the absolute frame forbidden by Relativity; (2) Solar system motion? See abuse of Doppler effect.

Claim #3: COBE even detected the annual variation due to Earth's motion around the sun - the ultimate proof of Copernicus' hypothesis.

Response: Other ether detection experiments – from Milller to DeWitte – have two distinct variations:

- A primary one with period of a sidereal day
- A secondary one with period of one year.

It is the secondary dipole variation that is referred to here, lending Cosmic Microwave Background support to the results of the other investigations. For Earth's motion around the sun, see abuse of Doppler effect.

Claim #4: The COBE 30 μK pattern displayed the creation of stars and galaxies in the early stages of the universe. It provided the first evidence for the density inhomogeneities from which all structure in the universe originated, confirming the Big Bang model.

Response: If the above were true, there would be:

- no clear dipole pattern, as seen in reality.
- a correlation between the observed density irregularities and the present structure of the universe. No such correlation has been published in the physics mainstream press.

Claim #5: The Cosmic Microwave Background dipole shows that we are traveling very fast through the universe. There is the motion of our Local Group of galaxies relative to the Cosmic Microwave Background photons, the motion of our Galaxy relative to the Local Group as a whole, the motion of the sun round the galaxy, and the annual motion of the Earth round the sun. If you were to believe that we are genuinely at rest in a special place, then you would have to decide where that rest place is.

Response: That makes velocity a matter of personal choice, and thus meaningless. In effect, the term "velocity" has no meaning in cosmology if it can be chosen to be anything. Also, see abuse of Doppler effect.

Claim #6: A plausible explanation for this observed large-scale anisotropy in the pattern of Cosmic Microwave Background radiation is that the radiation is isotropic on a large scale in the medium through which it is propagated and the solar system is moving through the medium with a velocity of .0012 times the speed of light through the medium. This velocity in the general direction of the star Regulus would cause Doppler shifts in the observed Cosmic Microwave Background radiation that would result in the observed dipole presence.

Response: But what of the contradictory interpretation of universal redshift recession? Why isn't the Big Bang recession of galaxies at much greater speed than the dipole speed detected in the Cosmic Microwave Background? What makes the cosmic expansion speeds invisible? Perhaps an objective view is that:

- The galaxies are not receding but are basically at rest in a radial direction
- The Earth is at rest, and the Regulus group is approaching us.

Claim #7: 1) The dipole effect is the result of the movement of our Earth, solar system, and galaxy through the universe; similar to the change in pitch of a sound as you ride by the source in a car or train. Specifically, the Cosmic Microwave Background temperature is 6.706 mK brighter in one direction of the sky than it is in the opposite direction as measured by the COBE mission. (2) Dipole effect caused by the Doppler effect of the Earth's movement in the Cosmic Microwave Background reflects the directional movement of the Milky Way.

Response: See abuse of Doppler effect.

Claim #8: There is a slight imbalance in the recession speeds of distant galaxies. In the direction of the constellation Leo they are not receding as fast as in the other direction.

Response: We are told the recession speed is dependent on distance, so there is a wide distribution of expansion speeds for remote galaxies. How does the Cosmic Microwave Background pick out only the Leo dipole speed, which is much less than the deep space recession speeds?

Claim #9: Special Relativity theory is not complete; it was replaced by General Relativity theory circa 1915.

Response: We can conclude, then, that:

- Special Relativity theory cannot be used for cosmology.
- General Relativity theory did not extend Special Relativity to accelerated frames and gravitational fields, as most others claim.

Claim #10: In General Relativity, when you get a solution to the Einstein equations that defines a spacetime, then typically that spacetime has a preferred frame and you can determine an absolute velocity. The metric which normal working cosmologists use, the Friedman-Robertson-Walker metric, has a built in absolute rest and a notion of absolute velocity. In an expanding universe there is a preferred frame, or class of preferred frames (there is no preferred origin).

Response: A revealing re-write of Relativity, which now does not allow a free choice of reference systems, but uses models with absolute speeds. Without a preferred origin, we know how fast we are going, but not where we are?! Apparently all the content and meaning can be changed in Relativity, but never the name itself. The greatest obstacle to discovery is not ignorance, but the illusion of false knowledge.

Claim #11: The crucial assumption of Relativity is that there are no reference frames where the laws of physics are different. Yet there is a reference frame where the Cosmic Microwave Background is at rest. You could call this the rest frame of the universe, but observers in that reference frame have no 'privileged' view of the universe and there is nothing any more 'absolute' about the velocity of an object with respect to that frame than with respect to any other reference frame. No experiment done in the Cosmic Microwave Background rest frame would yield a different result than the same experiment done in any other reference frame. All the laws of physics operate exactly the same as they do in the Earth rest frame, or any other reference frame.

Response: Yet another view of what Relativity and rest frame mean. Although almost all believers in Relativity say they subscribe to the Einstein brands of Special Relativity and General Relativity, each seems to have an individual interpretation of the meaning and application of Relativity to experimental results. These interpretations are usually divergent. The above argument claims that all frames are equivalent (and does not even restrict the choices to inertial frames), but ignores the testimony of the Cosmic Microwave Background dipole, that is, that there is a preferred orientation in space, as seen from Earth.

Claim #12: If the Earth were the focal center of the universe the Cosmic Microwave Background would show no dipole effect, as it too would revolve around the Earth.

Response: The Cosmic Microwave Background dipole is usually interpreted as caused by the motion of the Earth at 370 km/s through the Cosmic Microwave Background toward Regulus. But the data itself indicates that the Regulus direction is an energy source, the hottest spot in the Cosmic Microwave Background spectrum of the universe, a possible source for the ether flow that causes the effects we now term gravity and the periodic motions of the heavens. The source acts as a beacon as the sky rotates each (sidereal) day.

Claim #13: The variation in the universe's temperature shows how the matter and energy of the very early universe (300,000 years of age) were distributed. In order for the mass of the universe to be clumped together nowadays in galaxies and galaxy clusters, theory requires that the early universe be non-uniform. The COBE discovery revolutionized cosmology by giving us rich information about the initial conditions of the universe.

Response: What the COBE Cosmic Microwave Background dipole revealed to us was not anything about the universe's start, but rather it:

- Disproved the cosmological principle of large-scale homogeneity.
- Challenged the foundations of the Big Bang theory.
- Established a universal energy source and direction in space.
- Was totally unexpected and still unexplained by theorists.
- Established that the universe has an absolute reference system, debunking Relativity theories and crying out for new paradigms for explanation (or the revival of pre-Copernican beliefs).

Summary

In Special Relativity, there is no special linear velocity determined by the laws of physics, per se, but the velocity of the cosmic microwave background radiation is considered special, and a sophism intended to ignore the stark collision with Special Relativity theory. A firm statement is made (*e.g.*, no absolute reference frame) followed by an immediate exception (*e.g.*, the Cosmic Microwave Background) which is hedged (*e.g.*, it could be a preferred frame [but which Relativity theory forbids]). This logical tangle sets the scene for accepting a contradiction within the Relativity paradigm – the Cosmic Microwave Background as a universal absolute rest frame.

Nodland, Ralston (1997)

In 1997, Nodland and Ralston measured astronomical polarization of light from galaxies from various distances and directions. Analysis of the data indicated that the universe seemed to have an optical axis: it rotated the polarization direction of linearly polarized light! This cosmic polarization had an optical axis parallel to the direction Aquila-Earth-Sextans. Could the universe be rotating?

In the standard cosmic model, the universe is expanding symmetrically from its Big Bang origin and space has no preferred direction. Light moves isotropically, coming from any direction. However, polarization measurements from distant radio galaxies that emit strongly polarized waves similar to synchrotron radiation showed a rotation of the polarization plane that was proportional to the propagation distance as projected along a fixed direction in space. The magnitude of the polarization was empirically found to be:

$$Kr \cos\theta$$

where K is a constant, r the distance from Earth to source, and θ the angle from line of sight to the equator. The rate of rotation of the polarization plane depends on the angle between the direction of travel of the polarized wave and a fixed direction in space, pointing approximately toward the constellation Sextens from Earth. The closer to parallel of the direction of straight-line travel of the wave with this fixed direction, the greater the rotation of the polarization plane of the wave. The amount of polarization rotation is also proportional to the distance traveled.

The rotation claimed was truly small: one period of polarization rotation completed in about ten billion ($10^{10)}$ years. The signal was detected in the microwaves emitted by distant radio galaxies and separated from common Faraday rotation produced by magnetic fields in the intervening space. The results represent an analysis of electromagnetic radiation data that has been compiled and published by several independent research groups since the 1980s. Polarization measurements of electromagnetic synchrotron radiation emitted by distant radio galaxies were studied. Extensive computer aided calculations indicates that this radiation exhibits an unconventional rotation of its polarization plane. The effect is small, and is masked by other polarization rotation effects. The polarization rotation depends systematically on the angle between the radiation's direction of travel and a fixed direction in space, indicating electromagnetic anisotropy.

Birefringence:

Does the universe behave like a special type of optical crystal in which light in one direction acts differently from light in a different direction? Radio waves from distant galaxies must pass through random magnetic fields and cosmic plasma composed of ions and electrons. The Faraday effect predicts the polarization of the radio waves (the orientation of their electric fields) will rotate slightly on their way through space. The effect is proportional to the magnetic field strengths and ion densities, as well as the square of the wavelength.

Claims and Responses

Claim #1: The infinite anisotropy axis running through Aquila, Earth and Sextans only represents a *direction,* a *vector* in space. Any other axis – possibly vastly remote from Earth, Sextans and Aquila – parallel to the anisotropy axis shown here, will suffice in defining the anisotropy vector. No particular *location* in space, like the location of Earth for example, is relevant - only *directions* are relevant.

Response: The observations from Earth indicate that the axis passes through, and is centered on, the Earth. Maintaining that the line is a vector representing an infinite set of parallel lines in the Sextans-Earth-Aquila direction is a mathematical statement without experimental support. Observation of the polarization far from Earth would be needed to confirm the claim above.

Claim #2: A local effect of the Milky Way galaxy might account for our correlation.

Response: The correlation is seen for large redshift/distances ($z > 0.3$) but not at small distances where $z < 0.3$. This effectively rules out a local effect.

Claim #3: Strong galactic magnetic fields might generate non-random polarization directions, or upset the Faraday-based compensations. There would also have to be a distance dependence for this preferred orientation.

Response: But the correlation is observed over the entire sky; any explanation like this requires a highly unlikely conjunction and cooperation between remote objects at large angles of separation. A study of polarization rotation data for 160 galaxies points to a mysterious angular dependency across the sky, as if the universe had an axis. This anomaly challenges some sacred icons in physics, for example:

- there is no preferred motion in space – in direction or speed.
- space itself is isotropic (the same in all directions) or
- homogeneous (the same in all places).

Summary

Nodland and Ralston do not suggest rotation as a possible explanation, saying it may be the vacuum of space twisting the electric fields of the radio waves to polarize them in transit. Without using the word "ether" itself, this statement is essentially the contention of the Geocentric theory – that the firmament causes all the heavenly motions we see, even the smallest details. It was found that the universal torsion fields [here read ether flow] produce rotation of particles as they travel, are not evenly distributed, but rather form a cosmic axis through space. The closer a particle is to this cosmic axis, the more rotation is produced. For one who is unencumbered by modern cosmic speculative theories like the Big Bang and the Cosmic Uniformity Principle, the simplest explanation would be a real axial rotation of everything in a finite universe. Of course a cosmic axis is anathema to Big Bang theorists because it implies a center and an edge to the universe. In contrast to the drawn-out two-year peer review process given to the Nodland-Ralston paper, the criticisms in reply were almost immediate and seemed a bit desperate in their dismissal of the careful investigation. Is it coincidence that the constellation Sextans stands for the *sextant,* the ancient instrument by which mariners would navigate? Or that Aquila is a messenger from Heaven – the mythological Eagle leading souls to immortality.

Several authors (*e.g.*, Birch, Obukhov-Korotky-Hehl and Kühne) have dared to use a cosmic rotation model to explain the results, but try to maintain the standard cosmic view using General Relativity. Rotation of the polarization of an electromagnetic wave would be an effect of the cosmic rotation and spacetime curvature, which also accounts for other image characteristics like size, shape and orientation.

Pain and Ralston later used a larger data set and found that isotropy was definitively eliminated. The direction was slightly adjusted from the original report to be at: [R.A. = (0h, 9m) ± (1h, 0m), Decl. = -1° ± 15°]. This puts the polarization axis on the vernal equinox line, which is the line in space connecting the sun with the Earth when day and night are of equal length. Axis parameters concordant with the axis parameters in Nodland and Ralston have been found to coincide with the Cosmic Microwave Background dipole direction by Kuhne and by Bracewell-Eschelmann.

There seems that the statistical analysis is pointing out two directions of polarization:

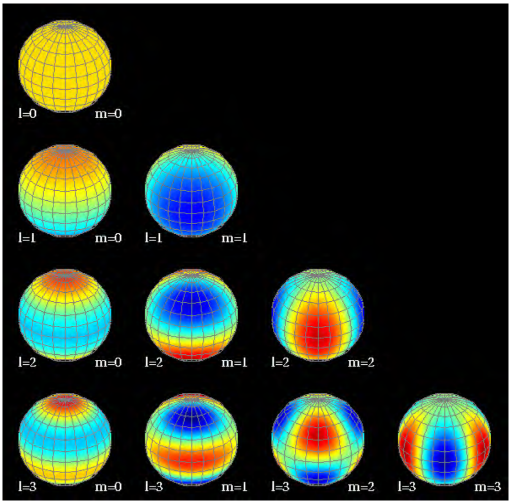
1. The Cosmic Microwave Background dipole direction toward the Leo-Virgo clusters, independently determined by COBE.
2. A new direction in the ecliptic plane along the equinox, which will be confirmed by analysis of higher Cosmic Microwave Background multipoles.

The data does not lie. Objective physicists are now being dragged, albeit reluctantly, in the direction of truth. We interpret the galactic polarization data as indicative of sources that are geocentric: symmetric around AND centered on the Earth!

Tegmark CMB quadrupole, octopole (2005)

What are multipoles? Multipole vectors are a mathematical representation of the Cosmic Microwave Background sky in expanded spherical harmonic coordinates yielding evidence for statistical correlation of multipoles with spatial anisotropy (preferred cosmic directions). Note that the origin of the spherical expansion is the Earth. This is the tool chosen to analyze the Cosmic Microwave Background spectrum. Graphic representations shown below for lowest multipoles:

l	**Name**
0	Monopole
1	Dipole
2	Quadrupole
3	Octopole
4	Hexadecapole



Clem Pryke (pryke@aupc1.uchicago.edu)
Cosmic Microwave Background multipoles for l = 0 to 3 and m <= l

Overview:

The multipole vector framework was applied to full-sky maps derived from the first year Wilkinson Microwave Anisotropy Probe (WMAP) data. The Wilkinson Microwave Anisotropy Probe appears to show something amiss with the standard model of cosmology, as it takes the sky temperature from 1.5 million kilometers in space. “Inflation plus cold dark matter” is the working hypothesis for how structure formed in the universe. The precise shape of the angular power spectrum depends not only on the underlying inflation model, but also on cosmological parameters such as the Hubble constant, the mass density and the composition of the dark matter. The 2500 or so independent multipoles that can be measured have enormous potential to determine cosmological parameters and to test theories of the early universe.

Cosmologists think the tiny variations were imprinted when matter began to clump together under gravity as the Big Bang cooled. Hotter patches were once denser regions, cooler patches were once less dense. The density variations began as quantum vacuum fluctuations during the universe’s first moments and which were blown up by inflation, a period of accelerated Big Bang expansion. These random quantum variations should be found in the broad cosmic features of the Cosmic Microwave Background as random and patternless, with no specific identification of local objects or structures.

After correcting for the dipole’s Doppler effect, it was found that the temperature of the galactic plane (coming from our galaxy) is slightly warmer than the rest of the universe. This represents the higher pole contribution to the Cosmic Microwave Background temperature map.

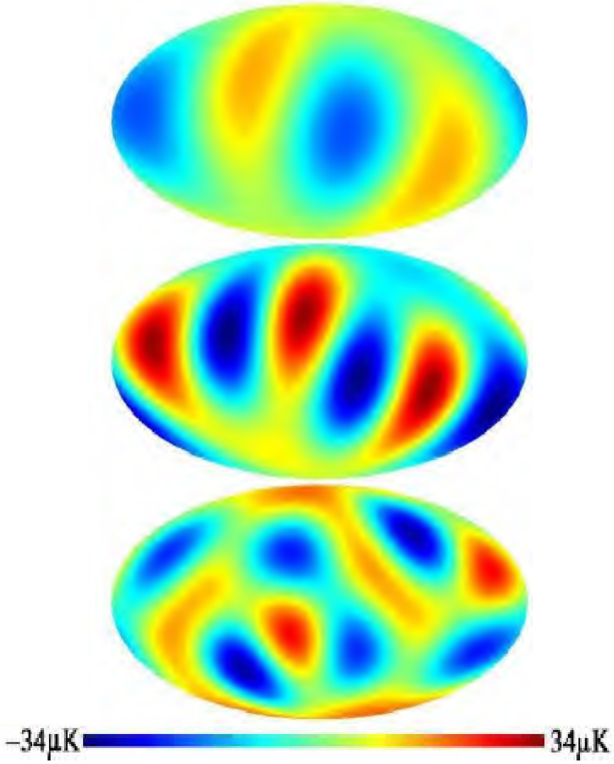
In 2005, Magueijo and Land found an alignment in the cosmic microwave background. The large-angle (low-) correlations of the Cosmic Microwave Background exhibit several statistically significant anomalies compared to the standard inflationary cosmology. The quadrupole plane and three of the octopole planes are very closely aligned. Three of these planes are orthogonal to the ecliptic, and the normals [vectors] to these planes are aligned with the direction of the Cosmic Microwave Background dipole and with the two equinoxes. The remaining octopole plane is orthogonal to the supergalactic plane. All these alignments have confidence levels > 99%. In fact a comparison with 100,000 random skies populated by Monte Carlo methods shows each correlation is unlikely with 99% confidence. The hot/cold spots in each pattern seemed to line up along the same direction, contrary to the random distribution assumption. Magueijo called this alignment “the axis of evil.”

Analysis:

1. The near vanishing of the two-point angular correlation function at angular separations greater than about 60 degrees, related to the low amplitude of the quadrupole contribution (***l*** = 2 spherical harmonic) in a spherical harmonic expansion of the Cosmic Microwave Background sky. The real significance of this low value compared to the predictions of the Big Bang is now contested by mainstream scientists.
2. The ecliptic line moves between hot spots and cold spots over a third of the sky, avoiding the octupole extrema over the rest.
3. Deviation from the predicted bell-curve distribution. The quadrupole-octopole correlation is statistically excluded from being possible in a Gaussian random isotropic sky.
4. The quadrupole spectrum is almost the same as the dipole spectrum.
5. The quadrupole and octopole are aligned.
6. The octopole is unusually planar - the hot and cold spots of the octopolar anisotropies lie nearly in a plane.
7. The quadrupole-octopole correlation is excluded from being a chance occurrence in a Gaussian random statistically isotropic sky with high confidence.
8. Three of the four octopole normals lie near the ecliptic plane.
9. Three of the four planes defined by the quadrupole and octopole are nearly orthogonal to the ecliptic.
10. A chance alignment of the normals with the ecliptic plane is excluded at > 99% copn.
11. The three normals near the ecliptic also lie very near the axis of the dipole.
12. The dipole axis lies close to the equinoxes.
13. Three of the normals align with the equinoxes.
14. Four of the normals are orthogonal to the ecliptic poles.
15. Three of the four planes defined by the quadrupole and octopole are nearly orthogonal to the ecliptic.
16. A north-south ecliptic asymmetry – the three extrema in the north are visibly weaker than those in the south.
17. Planarity of the quadrupole-plus-octopole.
18. The planes defined by the octopole are nearly aligned with the plane of the Doppler-subtracted quadrupole.
19. Three of these planes are orthogonal to the ecliptic plane, with normals aligned with the dipole (or the equinoxes).
20. The fourth octupole plane is perpendicular to the supergalactic plane.
21. The ecliptic threads between a hot and a cold spot of the combined Doppler-subtracted-quadrupole and octopole map.

22. The ecliptic separates the three strong extrema from the three weak extrema of the map.
23. A deficit in large-scale multipole power exists between the north and south ecliptic hemispheres.
24. The $\boldsymbol{l} = 4$ to 8 multipoles are very unlikely to be correlated (< 1%) with $\boldsymbol{l} = 2$ and 3.
25. Most low multipoles of the near Galaxy are far from the Cosmic Microwave Background multipoles, removing the Milky Way structure as a reasonable cause of the observed Cosmic Microwave Background correlations.
26. The presence of preferred directions in the multipoles seems to extend beyond the octopole to higher multipoles, with an associated mirror symmetry

All 26 of these anomalies contradict the standard picture of the universe and have no explanation.



Dipole-filtered CMB Map[329]

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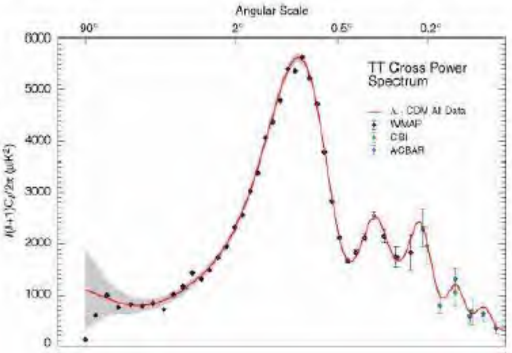
[329] http://lambda.gsfc.nasa.gov

The quadrupole (top), octopole (middle) and hexadecapole (bottom) components of the dipole-filtered CMB map on a common temperature scale. The quadrupole has low power; both it and the octopole have a common axis, the Galaxy plane. Significant features of the diagram above:

1. Both the quadrupole and the octopole have their power suppressed along a particular axis between the two, roughly towards (-110°, 60°) in Virgo.
2. How significant is this quadrupole-octopole alignment? The probability is only about 1.6% of an accidental chance alignment.
3. The quadrupole magnitude is low with a suspicious alignment. A generic quadrupole has three orthogonal pairs of extrema (two maxima, two minima and two saddle points). The actual Cosmic Microwave Background quadrupole has its strongest pair of lobes near the Galactic plane.
4. Filtering the galaxy contribution primarily affects the quadrupole, removing a large fraction of its power. Other poles are affected slightly.
5. The saddle point is close to zero, implying a preferred axis in space where the quadrupole has no power.
6. The observed quadrupole is the sum of the cosmic quadrupole and the dynamic quadrupole due to our motion relative to the Cosmic Microwave Background rest frame. The latter should be subtracted when studying the cosmic contribution.
7. The overall octopole power is large, having a preferred axis along which power is suppressed, the same axis as the quadrupole.
8. In contrast, the hexadecapole acts like an isotropic random field, with no intrinsic direction detected.



WMAP angular power spectrum of CMB temperature fluctuations.[330]

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[330] http://lambda.gsfc.nasa.gov

> The separation angle plotted at top is conjugate to the multipole number l : $\theta \sim 180^0/l$. This multipole plot does not agree with theoretical predictions for an infinite Euclidean space (curved line), but deviates from theory for low multipoles < 4.

Music Analogy:

Just as the sound vibrations of a drum may be expressed as a combination of its harmonics, so fluctuations in the cosmic background radiation may be expressed as combinations of the vibrational modes of space itself. When the level of fluctuations is plotted as a function of angle, we find a characteristic of spatial geometry over all time. The position of maxima in the angular spectrum is described by their wave number or mode $\boldsymbol{l} = 180°/\theta$, where θ is the angular distance in the sky. The lowest mode - the dipole or $\boldsymbol{l} = 1$ mode - is undetectable, swamped by the far stronger dipole. The first observable mode, the $\boldsymbol{l} = 2$ or quadrupole mode, was seven times weaker than the predictions for a flat, infinite universe. The octopole or $\boldsymbol{l} = 3$ mode was also less than the expected value by a factor of about two-thirds. For higher modes up to $\boldsymbol{l} = 900$, corresponding to angular scales of just 0.2°, the Wilkinson Microwave Anisotropy Probe data are fairly consistent with the standard model. But the distribution of temperature fluctuations is not fully isotropic and the fluctuations are distributed differently on different angular scales. The unusually low amplitudes of the quadrupole and octopole modes means that long wavelengths (*i.e.* temperature fluctuations over large angular scales) are missing, possibly because space is not big enough to sustain them, like vibrations of a string fixed at both ends, where the maximum wavelength is twice the string length. In a stringed musical instrument this would mean that the low bass notes would be missing. Only with a very long string, of "infinite" length, would all harmonics be fully represented.

The straightforward geometrical explanation of the power spectrum implies that we live in a finite space that is smaller than we currently observe. There is also evidence that the shape of the spectrum might reflect local conditions because there are differences between northern and southern galactic hemispheres and the largest fluctuations are in the solar system plane.

From Dr Max Tegmark, of the University of Pennsylvania, CMB analyst:

> The entire observable Universe is inside this sphere, with us at the **center** of it….We found something very bizarre; there is

> some extra, so far unexplained structure in the Cosmic Microwave Background… We had expected that the microwave background would be truly isotropic, with no preferred direction in space but that may not be the case. The octopole and quadropole components are arranged in a straight line across the sky, along a kind of cosmic equator. That's weird… We don't think this is due to foreground contamination. It could be telling us something about the shape of space on the largest scales. We did not expect this and cannot yet explain it.

Interpretation:

The undersized multipoles for $l < 4$ (low multipole cutoff) indicate that the universe is cut-off at large distances, which means a cosmos that is finite in space! It cannot be bigger than now observed in the Cosmic Microwave Background sky.

The correlation of the normals with the ecliptic poles suggest an unknown source or sink of Cosmic Microwave Background radiation. If it is a physical source or sink in the inner solar system, it would cause an annual temporal modulation or appear in polarization maps. So we must look deeper into space.

Physical correlation of the Cosmic Microwave Background with the equinoxes is hard to explain, since the Wilkinson Microwave Anisotropy Probe satellite has no knowledge of the inclination of the Earth's spin axis. Whence these correlations?

The correct explanation of these unexpected Cosmic Microwave Background correlations is currently not known. There are four possibilities:

(1) There is a systematic error (an error in the data analysis or instrument modeling).
(2) The source is astrophysical (*i.e.* an unexpected foreground).
(3) It is cosmological in nature (*e.g.* an anisotropic universe with nontrivial topology).
(4) The observed correlations are a pure statistical fluke.

A statistical fluke can be eliminated, based on the high confidence levels and the varying independent data sets and analysts. If indeed the $l = 2, 3$, Cosmic Microwave Background fluctuations are inconsistent with the predictions of standard cosmology, then one must reconsider all Cosmic Microwave Background results within the standard paradigm which rely on low l's.

Suggestions for the cause of the preferred ***l*** = 2, 3 axis:

(1) A feature of a non-trivial cosmic topology. For example, a universe with a football or doughnut/torus shape, the symmetry axis being the observed direction.
(2) Anisotropic Big Bang expansion, i.e, different speeds in different directions.
(3) Intrinsic cosmic inhomogeneity, basically, the ether as a euphemism.
(4) The universe is really rotating, making the rotation axis different from other directions.

Geocentrism

The cosmological principle assumes that the universe is the same in all places and directions; otherwise, it would be impossible to solve Einstein's equations. If this assumption is wrong, the standard Big Bang model of cosmology would be unusable.

The Cosmic Microwave Background octupole and quadrupole components were expected to form no pattern at all, but the results were anything but random. If the multipole vectors of the quadrupole and the octopole are correlated with the ecliptic poles, the axis at 90° to the solar system plane and with the dipole direction, then this suggests that the large wavelengths/low frequencies are missing because we are seeing the influence of the solar system environment, not the global properties of space. And we see these missing features because of our privileged position in the center of space. As might be expected from past history, despite these totally unpredicted and unexplained anomalies, the Cosmic Microwave Background data is regarded as a dramatic confirmation of standard inflationary cosmology! In fact, the axial correlation between multipole harmonics has been dubbed the "Axis of Evil." The combination of a complete lack of any known systematic error, and long odds against random alignment that has earned the low-alignment anomaly this nickname. Why is the axis called "evil"? Because it represents a return to the forbidden days of five centuries ago, when all science was geocentric/geostatic. It is the plain indication of an inherently inhomogeneous and anisotropic universe.

If its causes are of both deep space and local origin, the explanation might be found in an interaction of local structures with the deep space source(s) of the ether. Conventional physicists assume the dipole comes from the solar system motion through the Cosmic Microwave Background rest frame. Not being of cosmic origin, they subtract the Cosmic

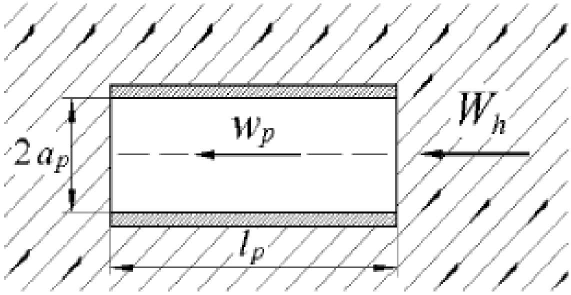
Microwave Background dipole moment from computations of all other multipoles. This throws the baby out with the bathwater. The dipole is 1000 times stronger than any other pole; it points to the source of the Cosmic Microwave Background.

The largest signal in the Cosmic Microwave Background anisotropy is the dipole, 3.346 mK in the direction (l = 264, b = 48) in galactic coordinates. This is attributed to the motion of the sun at 370 km/s with respect to the rest frame defined by the Cosmic Microwave Background. The solar motion implies the presence of a kinematically induced Doppler quadrupole. This is an artifact of the antigeocentric premise: if the multipole hot spots indicate the ether source(s) in the cosmos then the multipoles have nothing to do with the kinematics of matter. Doesn't anyone realize that the universal Cosmic Microwave Background has local axial and planar symmetries only when viewed from Earth? Doesn't any scientist on this planet realize that it isn't a planet? When will our stiff-necked scientists bow their heads and acknowledge the elephant in the living room, the emperor with no clothes?

The tiny and tall,
The big and the small,
The Lord God Almighty,
He alone made it all!

Galaev (1998)

A tube is placed into a gas stream perpendicular to the stream direction. With no pressure drop across the tube the gas inside the tube will be static. The tube is rotated 90° so the gas stream is along the tube axis, causing a pressure drop and gas motion.



Tube and gas flow parallel[331]

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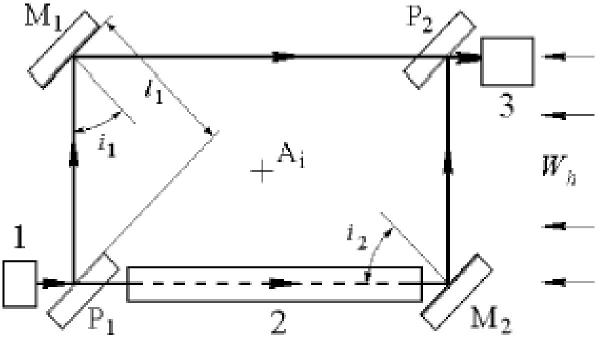
[331] http://home.t01.itscom.net/allais/blackprior/galaev /galaev-2.pdf Fig 1.

$\mathbf{W_h}$ is the horizontal ether speed component outside the pipe, $\mathbf{W_p}$ inside the pipe, a and l_p are the pipe's radius and length. The ether flow is shown as slanting thin vectors. The metal tube walls have major ether-dynamic resistance, when the ether flow is normal to the tube axis, the interior ether flow is minimal. The ether velocity caused by the horizontal velocity, $\mathbf{W_h}$, creates the ether flow in the tube, having mean velocity $\mathbf{W_p}$. The tube is a channel for the ether stream that will be treated by the laws of viscous liquid hydrodynamics. The time to reach steady-state conditions depends on the kinematic ether viscosity, the tube size and the velocity of the exterior gas stream. The gas stream in the tube is almost uniform, with a sharp reduction to zero in a thin boundary layer near the wall. With a light beam inside the tube, and another outside in the exterior ether flow, turning the tube at a right angle will form an interference pattern, after stabilization, by combining the two beams. See below.



Optical interferometer layout Source 1; tube 2; eyepiece 3; P_1, P_2 half-silver mirrors; M_1 , M_2 full-silver mirrors; A_i rotation axis; l_1, i_1 ,i_2 as shown above[332]

Key principle: Since the ether velocity changes from 0 to maximum with a 90° rotation, the phase of a light wave should also change according to the time variation of the ether velocity **Wp**(t). The phase offset will be proportional to the ether exterior velocity and the stabilization time will define the ether kinematic viscosity. The light beam is divided by P_1 into two beams, which combine at P_2 with a phase difference:

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[332] http://home.t01.itscom.net/allais/blackprior/galaev /galaev-2.pdf Fig 3.

$$\phi\square = 4\pi l_1 (\cos i_1 - \cos i_2)/\lambda$$

By geometry, the phase difference between the two beams is proportional to the small difference in the ether velocity inside the tube, $\mathbf{W_p}(t)$, and outside, $\mathbf{W_h}$:

$$\Delta\phi = l_p(\mathbf{W_h}-\mathbf{W_p})/\lambda c$$

The maximum phase shift occurs when the internal ether velocity Wp is zero, maximum $\Delta\phi = l_p\mathbf{W_h}/\lambda c$. Zero phase difference occurs when the ether velocities are equal inside and outside the tube. Solving the last equation for $\mathbf{W_h}$,

$$W_h = \lambda c\ \Delta\phi_{max} / l_p$$

Substituting in the $\Delta\phi$ □equation :

$$W_p = \lambda c / l_p(\Delta\phi_{max\,-}\square\Delta\phi)$$

The ether kinematic viscosity is calculated to be 7.06×10^{-5} m^2/sec; the measured value is 6.24×10^{-5} m^2/sec. This is within the range of real gases: $CO_2 = 7 \times 10^{-6}$ m^2/sec, He = 1.06×10^{-4} m^2/sec .

Summary of the result types:

- horizontal ether velocity $\mathbf{W_h}$.
- a daily record of the ether drift velocity:
    - in each stellar day.
    - daily course averaged during the year by month - $\mathbf{W_h}$ (S).
    - averaged for all measurements - $\mathbf{W_h}$ (S).
- mean-square deflection $\mathbf{W_h}$ from its mean value σ_w .

The confidence interval of the measurements is 0.95. Over a year 2322 readouts were performed.

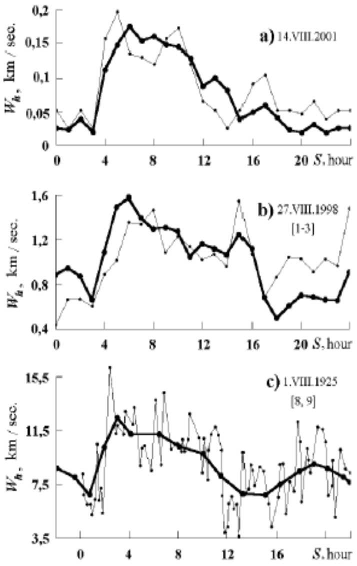

Diagram of four ether experiments all performed at various locations with three different interferometers over a period spanning 76 years – optical of order v/c in 2001, radio waves of order v/c in 1998, optical of order v^2/c^2 in 1925.

Each chart depicts ether velocity variation W_h within a stellar day in September.[333] The similarity in all three patterns varying over different locations, years, equipment and protocols is undeniable. The differing ether drift magnitude in each chart is caused by the corresponding altitudes of each interferometer: 1.6 m; 42 m; 1830 m, respectively.

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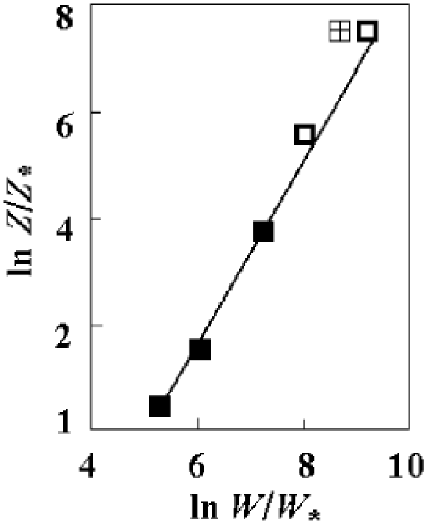
[333] http://home.t01.itscom.net/allais/blackprior/galaev/galaev-2.pdf Fig 8.



Normalized dependence of the ether velocity on altitude. W is the ether velocity at the height Z. Data points are from Galaev, Miller and Michelson experiments.[334]

The ether velocity increases linearly with the altitude, contributing to the many null results found around sea level. At ether velocities of 200-400 m/sec, second order effects are virtually undetectable. Second order sensitivity to the ether drift is 6 powers of ten lower than first order. The four experiments independently support the linear dependence of ether speed with height.

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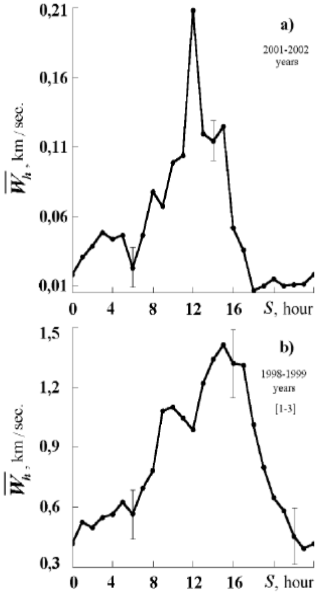
[334] http://home.t01.itscom.net/allais/blackprior/ galaev/galaev-2.pdf Fig 9.

Mean daily record of the ether velocity[335]



There is an annual as well as daily sidereal variation. Both parts of the diagram have similar features to the ether velocity variation within a day. Differences in the two shapes can be caused by viscous ether flow interaction with the local structures and terrain. In the top chart the ether drift velocities are smaller because of the lower altitude. Ether speed exhibits periodic changes over a stellar day, implying a cosmic origin for the ether. Since the speed of light ***c*** depends on the motion of its carrier, ***c*** will also fluctuate with a period of one stellar day. Light speed will also depend on its direction in the ether and increase with altitude above the Earth's surface.

Highlights:

- The ether drift data refuted a stationary medium.
- The Earth's orbital ether drift around the Sun at 30 km/sec was not detected.
- The comparison of the suspected ether drift results with other experiments, compensating for latitudes and heights above sea level, finds them in agreement.

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[335] http://home.t01.itscom.net/allais/blackprior/galaev/ galaev-2.pdf Fig 10.

- Annual reproducibility: Systematic measurements in months of the year matching the same months of past experiments compare favorably to the corresponding results of these past experiments.
- The old experiments that are second order in v/c are 10,000 times less accurate than modern experiments that are first order in *v/c*.
- Atsukovsky estimates the sound velocity in ether to be 10^{21} m/sec, which exceeds the speed of light by $> 10^{12}$ -- more than a trillion times faster.
- The daily variation of fringe pattern corresponded those variations measured in prior experiments within a 24-hour time frame.
- Measurements with radio wavelengths show a rather small horizontal ether component during part of a day.
- Interferometer measurements are proportional to a vertical velocity gradient for the ether motion near the Earth's surface. This gradient value is proportional to the ether drift velocity (to first order).
- Horizontal ether velocity changes measured in the same month of any year have similar variation within a day.

The primary comparison is with Miller's 1925 Mt. Wilson investigation, so a summary follows.

The Miller experiments

Location	Altitude	Ether drift km/sec
Cleveland	265 m.	3
Mount Wilson	1830 m.	10

Miller ether direction coordinates:
[RA 17.5 hr, dec + 65°]
compared to the ecliptic North pole:
[RA 18 hr, dec.+ 66°]

Miller concluded the ether flow has a galactic (space) origin and the speed was more than 200 km/sec, but he could not explain decrease from 200 to 10 km/sec.

Premises:

Ether originates in space with a vertical velocity gradient near the Earth's surface due to ether viscosity. The mean value of the maximal gradient equals 8.6 (m/sec)/m. The change of ether drift boundary layer with height is due to the relative movement of the solar system and the ether near the Earth's surface. Note: not due to the Earth's rotation! The analysis will use Galilean relativity: light speed for the observer is the velocity relative to the ether plus the ether velocity with regard to the observer.

Experimental problems:

Miller showed that null result Michelson-Morley experiments running inside hermetic metallic chambers diminish the ether they were trying to measure. Mt. Wilson was done in an open structure; Miller recommended minimal shielding for success in ether detection. But later experiments using resonators, masers and Mössbauer effect again used massive metallic chambers or lead shields for gamma ray protection - a common instrumental error of these experiments. Michelson's two-way interferometer of the second order is insensitive to the ether streams and too sensitive to the environment.

Four factors affecting the ether flow were distinguished:

1. Anisotropy: depends on light beam direction relative to the solar system and the ether flow.
2. Altitude: above the Earth's surface/sea level, caused by surface interaction with the viscous ether flow.
3. Cosmic: variation period of one stellar day, caused by a cosmic (galactic) source.
4. Hydro-aerodynamics ➔ ether-dynamics: motion of the viscous gas-like ether within the confinement housings, caused by solids interacting with the ether. The height effect is partially dependent on ether dynamics.

Ether properties:

- a material medium, responsible for electromagnetic wave propagation.
- similar to a viscous gas.
- metals have major ether-dynamic resistance.

Ether viscosity:

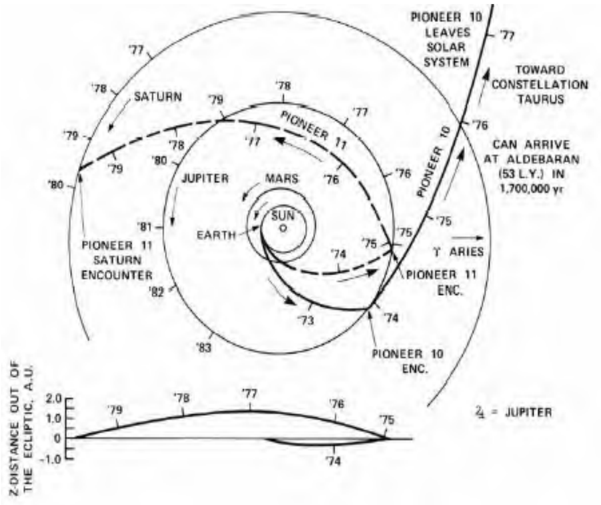
Viscosity measurement is of particular interest, as the experimental data for ether viscosity and its measuring methods have not been described in physics literature up to date. The kinematic viscosity values, calculated and measured, give a basis to consider that the ether stream is similar to real known gases in its interaction with solids, in passing around obstacles and moving through pipes. Solids interacting with the ether flow should encounter major ether-dynamic resistance. The interferometer test shows that a dielectric tube can channel the ether as well as the metal tube. The inability of ether flow to pass through obstacles explains the unsuccessful prior attempts to detect the ether drift with enclosed interferometers.

Pioneer 10, 11 Anomalies, 1972 - 2004 update

Description:

The Pioneer anomaly/effect is the measured deviation from trajectory models of various unmanned spacecraft visiting the outer solar system, notably Pioneer 10 and 11. Doppler tracking data from the Pioneer 10/11 spacecraft from between 20-70 AU, yields an unambiguous and independently confirmed anomalous blueshift drift of $2.92 \pm 0.44 \times 10^{-18}$ s/s^2. It can be interpreted as being due to a constant acceleration of $a_P = (8.74 \pm 1.33) \times 10^{-8}$ cm/s^2 directed towards the sun. No systematic effect has been able to explain the anomaly as of 2005.

The Pioneer 10 data spans 11 years; Pioneer 11 spans 4 years. At 20 AU, the spacecraft was sufficiently far from the sun for the pressure of solar radiation to have dropped to a level where the 252 kilogram probe could no longer be accelerated by the pressure. A systematic error then became apparent, an unexplained acceleration directed towards the sun that has been present ever since in all four spacecraft – the two Pioneers, Galileo and Ulysses. Although the data from the Galileo and Ulysses spacecraft indicate a similar effect, their design, spin-stabilization and proximity to the sun do not favor easy detection. Should the anomaly not be a force but rather a cause that affects all frequency standards, accelerometers will be ineffective in discovering the nature of the observed anomaly. There are no current space missions that are expected to provide useful data.


PIONEER 10 LEAVES SOLAR SYSTEM
'77
TOWARD CONSTELLATION TAURUS
'77
'78
SATURN
'79
'78
PIONEER 11
'77
'79
'78
'77
'80
'79
JUPITER
MARS
'76
'76
'76
PIONEER 10
CAN ARRIVE AT ALDEBARAN (53 L.Y.) IN 1,700,000 yr
'80
SUN
'75
'81
EARTH
'75
'75
♈ ARIES
'74
PIONEER 11 ENC.
PIONEER 11 SATURN ENCOUNTER
'82
'73
'74
'83
PIONEER 10 ENC.
Z-DISTANCE OUT OF THE ECLIPTIC, A.U.
2.0
1.0
0
-1.0
'79
'78
'77
'76
'75
'74
♃ = JUPITER

Summary of the Pioneer orbits in the interior of the solar system.[336]

Details of the effect:

1. The Voyager data was too coarse for testing.
2. Large, bound astronomical bodies show no signs of the anomaly, although the acceleration is too large to have escaped detection in planetary orbits, particularly for Earth and Mars.
3. The fundamental problem is measured as a Doppler shift; the delta in acceleration is inferred by holding ***c*** constant.
4. The range of the anomaly is unknown; it is basically constant between 20 and 70 AU. (NB: an AU (Astronomical Unit) is the Earth-sun distance, about 92 million miles)
5. It was masked by the larger solar wind acceleration until reaching 20 AU.
6. The direction of the acceleration is assumed to be towards the sun, but the resolution does not permit this assertion. It is possible that the acceleration is: (a) toward the Earth; (b) along the direction of motion, or (c) along the spin axis.
7. The actual direction indicates a physical origin that could be: (a) new dynamical physics originating from the sun; (b) a time signal anomaly; (c) a drag or inertial effect; (d) a property of the ether flow in the outer solar system; (e) an on-board systematic defect.

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[336] http://arxiv.org/PS_cache/gr-qc/pdf/0507/0507052.pdf Fig. 1.

8. When all systematic factors common to all four craft are taken into account, the anomaly still remains.
9. A Voyager-type space-craft is not appropriate; its frequent attitude-control maneuvers overwhelm any small external acceleration.
10. Ulysses data analysis discloses an unmodeled acceleration towards the Sun of $(12 \pm 3) \times 10^{-8}$ cm/s^2, about 50% higher than the Pioneer anomaly.
11. Viking ranging data accuracy limits any unmodeled radial acceleration acting on Earth and Mars to no more than 0.1×10^{-8} cm/s^2.
12. Ranging data are independent of the Doppler shift; they are found from signal time delay calculations of the motion are made on the basis of the range time-delay and/or the Doppler shift in the signals.
13. Despite large solar radiation effects, the nominal value obtained for the Galileo spacecraft by measurement was $\sim 8 \times 10^{-8}$ cm/s^2, comparable to the Pioneer values.
14. The $\boldsymbol{a}_P$ stays approximately constant for a long period (Pioneer 10 is now past 70 AU).
15. The Pioneer anomalous acceleration contradicts the accurately known motion of the inner planets.

Suggestions/interpretations:

- A gravitational frequency shift of Pioneer signals proportional to distance and the density of the interplanetary dust cannot be responsible for the anomaly; known properties of the dust are not large enough to produce the observed acceleration.
- The effects of dark matter or modified gravity fail because observable effects that should be seen on the orbits and distances of the planets are not seen.
- Possible problems with atomic clocks have been eliminated as a cause.
- The predominant opinion of a thrust from gas leakage does not explain why the leakage from four independent craft of three different designs has the same effect.
- Proposed missions to provide useful data include using two craft near Saturn at wide angles to pinpoint the effect direction by signal interferometry.
- internal systematic properties, undiscovered because of identical design.

- a viscous drag force proportional to the velocity of the Pioneers.
- Unknown mass distribution in the outer solar system.

The possibility of a new paradigm, or the reinstatement of an old one, may be in the offing.

C Anisotropy

The basic experimental observable is a Doppler frequency shift. If f_o refers to the observed frequency, f_m refers to the frequency predicted from theoretical models and f_r is the reference frequency, then:

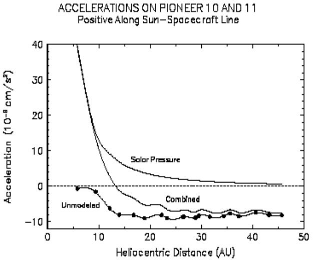
$$f_o - f_m = -f_r\,(2at/c) = -f_r\,(2v/c)$$

The frequency has been measured as decreasing at 6 x 10^{-9} hertz per second or 1.5 Hz over a period of 8 years. Since t and ***c*** are known, the non-Newtonian acceleration ***a*** has been the suspect. But the possibility of ***c*** changing with the ether density or flow has not been addressed. The behavior of the space probes provides dynamic information on the dependency of light speed on the ether of interplanetary space. The Pioneers are, in effect, mapping the solar system ether flow.

Measurements actually indicate that the observed Doppler frequency, f_o, is dropping with time. Let's solve for f_o from the above equation,

$$f_o = f_m - f_r\,(2at/c) = f_m - f_r\,(2v/c)$$

Since f_m remains unchanged, a decrease in observed frequency will occur with an increase in $f_r\,(2v/c)$ or a decrease in c. So a change in ***a*** or in ***c*** will cause the Pioneer effect.



Pioneer accelerations vs. distance from the sun.[337] The accelerations are: a) the calculated solar radiation acceleration (top line), b) the unmodeled acceleration (bottom line), and c) the measured combined acceleration (middle line)

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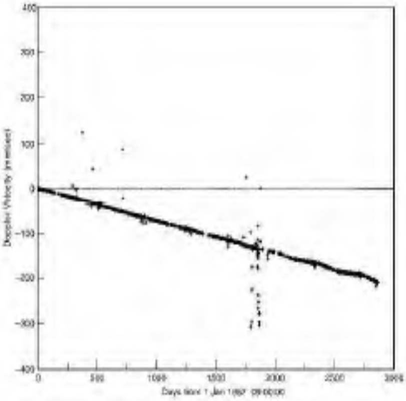
[337] http://arxiv.org/PS_cache/gr-qc/pdf/0104/0104064.pdf Fig. 3.

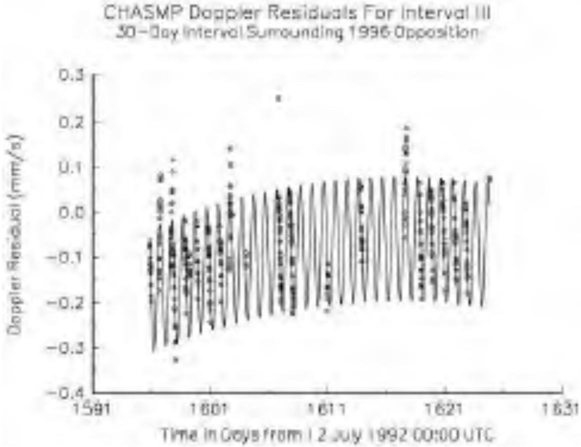
Subtraction of the measured acceleration from the solar wind/radiation pressure gives the unknown anomalous acceleration. The solar radiation pressure decreases as the inverse square, 1/ r^2.



Observed Doppler velocity minus model Doppler velocity for Pioneer 10 vs. time.[338]

The slope of the long term plot of velocity versus time above visually demonstrates that the acceleration is negative and constant. The drift is clear, definite, and cannot be removed without either adding acceleration, **a$_P$**, or the inclusion of a frequency drift or clock acceleration, ***a*t**.

Periodic variations:



Periodic Doppler shifts over 30 day interval[339]

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[338] http://arxiv.org/PS_cache/gr-qc/pdf/0104/0104064.pdf Fig. 6.

A pattern now becoming familiar: a short-term diurnal sine wave within an oscillating long term envelope. The data lacks the details to separate out either diurnal (solar day) from sidereal day, or to determine the direction of the source. The odds are on the Virgo-Leo cluster for the sidereal direction and the ecliptic normal for the annual variation.

An anomalous oscillatory annual term, smaller in size than the anomalous acceleration $\boldsymbol{a}_P$, has been found by using a 1-day average over all 11.5 years, yielding:

$$a_A = (7.77 \pm 0.16) \times 10^{-8}\ \mathrm{cm/s^2}$$

for the added annual oscillation. The presence of the small annual term on top of the complete solution is apparent in the graphic above. If approximated by a simple sine wave, the amplitude of the annual sinusoid is about 1.6×10^{-8} cm/s^2. Two different programs were independently able to produce similar post-fit residuals, giving confidence in the solutions.

A least-squares fit to an annual sine wave produced:

Amplitude **v**	0.1053 ± 0.0107 mm/s
Phase	5.3 ± 7.2
Angular velocity **ω**	0.0177 ± 0.0001 rad/day
Bias/offset	0.0720 ± 0.0082 mm/s

The amplitude v and angular velocity ω of the annual term results in a small acceleration amplitude of $a = v\boldsymbol{\omega} = (0.215 \pm 0.022) \times 10^{-8}$ cm/s^2. As seen above, there is a significant diurnal term in the Doppler residuals, with period approximately equal to the Earth's sidereal rotation period. The diurnal amplitude is comparable to that in the annual oscillation, but the angular velocity is 366 times larger. So the magnitude of the apparent angular acceleration, $(100.1 \pm 7.9) \times 10^{-8}$ cm/s^2, is large compared to $\mathbf{a}_P$. The best estimate of the amplitude of the Pioneer 10 sine wave is $(0.525 \pm 0.155) \times 10^{-8}$ cm/s^2 and that of the Pioneer 11 wave is $(0.498 \pm 0.176) \times 10^{-8}$ cm/s^2. The difference in phase between the Pioneer 10 and Pioneer 11 waves is 173.2, similar to the angular separation of the two spacecraft in ecliptic longitude. The amplitudes are in the same proportion as the cosines of the ecliptic latitudes for the two spacecraft. Are the annual and diurnal terms caused by a misalignment of the Pioneer orbits on the ecliptic?

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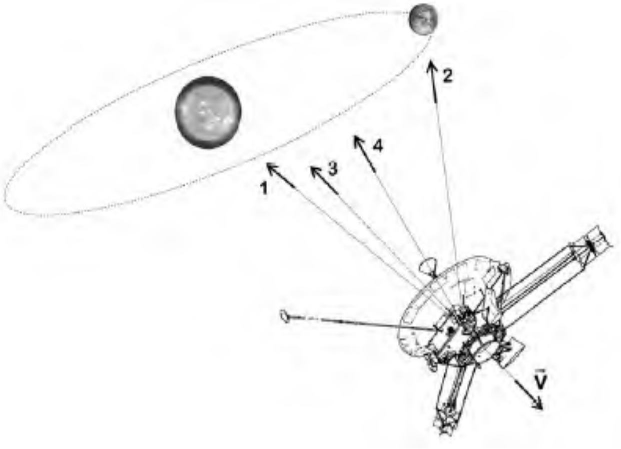
[339] http://arxiv.org/PS_cache/gr-qc/pdf/0104/0104064 .pdf Fig. 18.

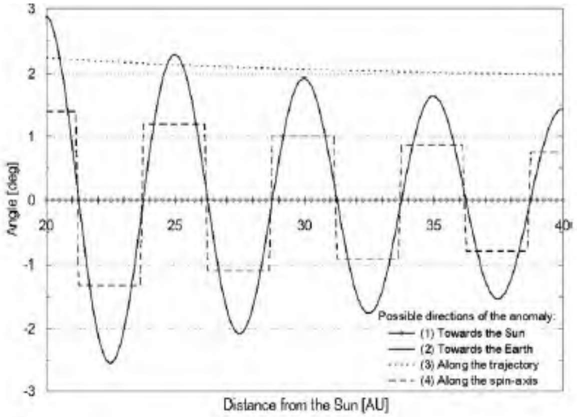
Still, the characteristic signature of a_P is a linear drift in the Doppler frequency, not the annual/diurnal features.



Direction of average acceleration[340]

Four possible directions for the Pioneer anomaly:

(1) towards the Sun,
(2) towards the Earth,
(3) along the direction of motion,
(4) along the spin axis.



Characteristics of four possible directions of the anomalous acceleration. The signatures are distinctively different.[341]

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[340] http://xxx.lanl.gov/PS_cache/gr-qc/pdf/0308/0308 017.pdf Fig 3.

At 20 AU, the angle between sun and Earth is only three degrees, which is the maximum angle subtended by the sun and the Earth. The average angle is < one degree. With the radiation pattern of the Pioneer antenna and the lack of precise 3D navigation, the determination of the exact direction of the anomaly is difficult. Without an improved antennae and navigation the following directions are indistinguishable:

(1) towards the sun
(2) towards the Earth
(3) along the direction of motion of the craft
(4) along the spin axis

This suggests, for each respective direction, the corresponding inference:

(1) new dynamical physics originating from Sun
(2) a time signal anomaly
(3) a drag or inertial effect, or
(4) an on-board systematic

- The angle from the sun (1) to the trajectory line is fixed.
- The angle towards the Earth (2) is a cosine curve formed by its orbit that is modified by a 1/*r* envelope as the craft moves further out. If the anomaly is directed towards the Earth (2), the current accuracy of the Earth's ephemeris and a sinusoid signal will be essential to determine this.
- An almost-linear angular change approaching the direction of the Sun would indicate a path-related source for the anomaly (3)
- The direction along the spin axis (4) is a series of decreasing step functions, created by the orientation maneuvers.

These four possible anomaly directions all have different characteristics. A future space mission dedicated to resolving the direction of the anomaly should be able to resolve the direction uncertainty.

Claims and Responses

Claim #1: The angle towards the Earth is a cosine curve formed by its orbit. If this cosine variation is observed, the conclusion is that the anomaly is pointed at the Earth, not the sun.

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[341] http://xxx.lanl.gov/PS_cache/gr-qc/pdf/0308/0308 017.pdf Fig. 4.

Response: No. There is a metaphysical assumption here that the Earth moves around the Sun. The reality is that the Earth is fixed, so no variation in direction should be seen. It is the sun that should display a sinusoid curve, in its motion around the Earth. This is a good example of how false cosmic premises compound conceptual errors. The erroneous interpretation of the results will be taken as more proof of a fixed sun and an Earth in orbit around it.

Claim #2: The Pioneer mystery was attributed to a possible "anomalous" acceleration (new physics!), directed toward the sun for both spacecraft.

Response: But if the Pioneer signal travels faster in the ether of space, due to either a change in its density or speed, the frequency shift/acceleration would be a consequence of the change in *c*.

Claim #3: The position of a spacecraft is found by examining the diurnal variation imparted to the Doppler shift by the Earth's rotation.

Response: Or the effect of the ether rotational flow on the spacecraft!

Claim #4: As the ground station rotates underneath a spacecraft, the Doppler shift is modulated by a sinusoid.

Response: Or the ether rotates between the two!

Claim #5: If the Pioneers are simulating the rotating Earth as in Foucault's experiment, a coordinate transformation to the Cosmic Microwave Background rest frame would entirely remove the Pioneer effect.

Response: No. The effect is absolute, due to the ether, and would be seen in any frame.

Claim #6: The annual and diurnal terms are likely different manifestations of the same modeling problem whose sources are both Earth-related.

Response: The terms are manifestations of an ether that flows through space. The Earth is related to these terms via the ether.

Summary of Data and Experiments

S = supported, D = disproof,
N = neutral or does not apply

Notes: "S" for an experiment does not indicate a proof or confirmation. All empirical evidence is inductive, increasing the probability of the theory's validity, but never excluding future improvement or even abandonment. "D" in any column for a theory requires responses to remove it, otherwise there is no rational reason to maintain a paradigm that cannot explain one or more experimental results within its scope. Only experimental evidence and common experience are investigated below. Theory is discussed as it pertains to the experiment. The first row is the consensus proposed by scientific opinion, which is often far from unanimous – especially in the interpretation of results by relativists. This also holds for the summary columns. The second row of each experiment is the geocentric view.

Dayton Miller, 1921

Proposal: A laborious and precise repetition of the Michelson-Morley experiment, with observations taken over a decade, at high altitude with large insulated and non-magnetic interferometers. Claim of ether detection disproved by Shankland.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = N

Geocentric Response: Proposed a modified ether model of partial drag/entrainment. Obtained positive results for a net ether drift of about 10 km/s towards the galactic North pole. This daily or seasonal effect destroys the foundation of the theory of Relativity.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = D

Illingworth, 1972; Joos, 1932

Proposal: A Michelson interferometer employing helium as the medium, hoping to reduce thermal variations due to *n*. Originally reported no ether drift, accurate to about 1 km/s. (Joos) intended to be a large vacuum interferometer, leaky equipment seals caused conversion to helium, chosen for its low refractive index, less than air. Small fringe shift showed a speed of only 1.5 km/s.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: Both Illingworth and Joos found similar results with helium. The change in *n* from air to helium confirmed the refractive index dependence, agreeing with the Michelson-Morley experiment and Miller about an absolute cosmic motion around 400 km/s.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = D

Pound-Rebka, 1959

Proposal: Demonstrated that a beam of very high energy gamma rays was slightly red shifted as it fought gravity and rose up a 22 meter elevator shaft at Harvard. The redshift predicted by General Relativity theory of two parts in a thousand trillion (2×10^{-15}) was detected to within one percent (1%) of the computed value. In the reverse direction the gamma waves were blue-shifted to a higher frequency so that the Mössbauer resonant absorption was reduced. The amount of shift in the wavelength corresponded directly to that predicted by General Relativity theory. Both modes show the validity of the Equivalence Principle.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = S

Geocentric Response: The Hatch scale predicts a change in ***c*** that also predicts the measured frequency shift and agrees with the Equivalence Principle to first order. The Pound-Rebka result thus supports both General Relativity theory and Geocentrism (and many others).

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = N, General Relativity = N

Jaseja, 1963

Proposal: Two He-Ne masers mounted with axes perpendicular on a rotating table produced a consistent interference pattern. Cited as yet another "null" result for absolute motion testing.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: A fringe pattern dip occurs at a sidereal time agreeing with the Miller cosmic direction. Unfortunately, without knowing the ratio of He to N, the exact value of *n* cannot be used to predict the actual ether speed. This test failed in two ways: (1) omitted the refraction correction, (2) no comparison was made with Miller's long-term data (5 years earlier) in sidereal time.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = D

Spinning Mössbauer disc; Chapeny, 1963; Turner-Hill, 1964

Proposal: One Way Tests of Light Speed with Mössbauer effect. Uses a rotating gamma ray source and fixed detector at the center of rotation to place an upper limit on any one-way anisotropy of 3 m/s. Reverses the light path direction by using a rotating source and fixed gamma ray detector at the center to place an upper limit on any one-way anisotropy of 10 m/s. Both spinning Mössbauer experiments use a one-way light path to confirm isotropy of light speed. They are strong evidence in support of Special Relativity by validating the claim of isotropic light speed in every inertial frame by showing that there is no detectable ether drift in the laboratory.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: Only in 2002 was the Michelson-Morley principle of operation understood; its proper analysis leads to rejection of Special Relativity theory in support of Geocentrism. Vacuum interferometers are worthless for detecting ether drift. Only gas Michelson interferometers can detect absolute motion. The drift speeds measured are similar to the Miller and corrected Michelson-Morley experiment. Should have been repeated in vacuum, to verify a true null result.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = D

Shamir-Fox, 1969

Proposal: Repeat of the Michelson-Morley experiment with He-Ne laser and plexiglass (n = 1.49) wave guides 0. 26 long. Interpreted in terms of the Fresnel drag and Lorentz contraction effects. Light within the plexiglass was modeled as dragged along with it, adding a speed of $(1-1/n^2)V_{ether}$ to the speed in the solid, c/n. No shifts were seen on rotation, though sensitivity was .00003, setting an upper limit on ether drift to 6.64 km/s. Conclusion: negative result "enhances the experimental basis of Special Relativity."

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: The use of solid media to detect absolute motion is hopeless, as Miller's data showed that solids absorb ether. Objectively, as a test of ether motion, this experiment was meaningless.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Shapiro Venus Radar, 1969

Proposal: Direct test of Einstein's second postulate and with General Relativity claims that ***c*** depended on the strength of the gravitational force along its path, in the 1961 interplanetary radar contact with Venus. The expected time delay, due to the passage close to the Sun, would be about 200 milliseconds. The test was successful.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = S

Geocentric Response: Bryan Wallace discovered in 1961 that radar distance measurements of the surface of the planet Venus did not confirm the constancy of the speed of light. There were systematic variations in the radar data containing diurnal, lunar and synodic components. Wallace's analysis strongly challenged the Shapiro reading of results. His analysis of sparsely published 1961 data on the interplanetary radar contact with Venus concludes the data showed a $c + v$ Galilean component.

Summary: Geocentric = S, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Brillet-Hall, 1979

Proposal: Employed a Fabry-Perot etalon setup with highly accurate lasers and a constant reference length to put an upper limit of 30 m/s for ***c*** one-way trips, but reduced this to only 0.000001 m/s for two-way light travel in static or partially entrained ether. This corresponds roughly to the Michelson-Morley experiment (no variations of the round-trip speed of light in different directions, with a time-scale of minutes). Temperature was stabilized inside a vacuum tube. Claimed to impose the most accurate limits on round-trip ***c*** anisotropy, since Brillet-Hall found the beat-frequency between a single-mode static laser and its rotating twin limited ***c*** anisotropy to 3 parts in 10^{15}.

Summary: Geocentric = D, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: No need to know anything more after the “vacuum” path is mentioned. Without a gas in the path ether interaction is virtually immeasurable – the Cahill criterion. When long term data collected by Brillet-Hall is analyzed it reveals a daily and annual low velocity periodic variation, anticipating confirmation by future tests of higher precision.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = N

Torr-Kolen, 1981

Proposal: Two atomic clocks separated by 500 meters look for sidereal phase variations between them. Guided wave one-way speed-of-light experiment based on the cut-off frequency of a wave guide. Claimed a clear null result for the anisotropy of cosmic radiation that defines a preferred frame of reference.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: The data clearly indicate a signal of about 0.5 μV representing eastward motion. This one-way phase shift disappeared from the complete round-trip measurement, showing that two-way light speed tests can mask changes in ***c***. Showed the ability to sense the speed of a test device using optical speed-of-light sensing in an enclosed room, a very definite disproof of Special Relativity!

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = D

Throbbing Earth, 1983

Proposal: Gravity-wave detectors in Geneva and Frascati, Italy operating for over a year have recorded ground pulsations, most likely expansions and contractions of the entire Earth. Pulse amplitudes are about 100 times larger than gravity wave expectations, but the key feature is the pulsing period – regularly every 12 sidereal hours, which indicates stellar origin.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = N, General Relativity = N

Geocentric Response: First, note that this has been known for over two decades, with no experimental follow-up or even proposed theory. Why is this astounding fact a scientific pariah? What sort of cosmic force could make Earth throb with energy with such precise celestial–based timing? Sidereal waves are anathema to the scientific modernist.

Summary: Geocentric = S, Heliocentric = N, Ether = N, Special Relativity = D, General Relativity = D

Silvertooth, 1986

Proposal: A first-order test of a one-way laser beam interfering with a standing wave initiated by the same laser. The standing wave nodes shifted position when the equipment direction was changed. One wave was phase modulated with respect to the other, creating phase differences that were measured with a photomultiplier tube of special design. Silvertooth's results demonstrate that the wavelength of light varies with the direction of its propagation. The experiment was repeated in 1992, with the same results.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: Silvertooth claimed his interferometer detected the absolute motion of the Earth with respect to the ether. Silvertooth's velocity vector points in a different direction, with twice the speed of Miller's ether velocity, but agrees with Holger Müller's ether velocity. He always found a preferred direction in the direction of the constellation Leo, traveling at a velocity of 378 km/sec. If relativity is correct, then this result should be total nonsense. If the result is correct, however, then it's relativity that is rubbish.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = D

DeWitte, 1991

Proposal: Over a six-month period of testing a 1.5km underground coaxial cable, DeWitte found a cyclic component in the phase drift between high-precision cesium-beam clocks. A 5MHz radio frequency signal generated from each cesium time-base produced two independent but identical signals to within the limits of cesium clock drift. The period proves to be the sidereal day, so DeWitte inferred the cause responsible for the phase shift was galactic, not man-made, in origin.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: No feedback from Relativists yet; it may be that the results are too new, or they are being ignored, or Relativity has no response. Confirms the Miller results with a non-interferometer experiment. Using the Fresnel drag correction predicts an ethereal speed of 900 km/s, far beyond the results of other experiments. This is just another contra-indication of the ether-drag concept, whether partial or total. To repeat this as a two way light-speed experiment, with round-trip measurement to see if a null-result would be obtained due to round-trip averaging, would be enlightening.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = D

CMB Dipole, 1996

Proposal: NASA's COBE satellite sky-mapping project revealed a dipole temperature anisotropy in the cosmic background radiation (CBR), indicating that the solar system is moving through this unique inertial frame at approximately 390 ± 60 km/s in the direction of Leo. In the CMB rest frame this is one part in 800 (0.13%) of ***c*** and more than 10 times the Earth's orbital speed.

Summary: Geocentric = N, Heliocentric = N, Ether = N, Special Relativity = S, General Relativity = S

Geocentric Response: If the CMB fills the universe, then its rest frame must be the absolute frame forbidden by Relativity. Why isn't the Big Bang recession of galaxies at much greater speed than the dipole speed detected in the CMB? What makes the cosmic expansion speeds invisible? The dipole shows that the galaxies are not receding but are basically at rest in a radial direction and the Earth is at rest, with the Regulus group approaching us. There is a preferred orientation in space, as seen from Earth. The universe has an absolute reference system, debunking Relativity theories; the cosmological principle is disproved. The CMB dipole was totally unexpected and still unexplained by theorists.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = D

Nodland-Ralston, 1997

Proposal: A statistical computer analysis of astrophysical data shows a systematic rotation of the polarization plane of radio waves depends on the waves' direction and travel distance. The effect is extracted independently from Faraday rotation, and found to be correlated with the angular positions and distances to the sources. Monte Carlo analysis yields probability 10^{-3} for the axis to be a random fluctuation. Dependence on redshift rules out a local effect. Barring a hidden systematic bias in the data, the correlation indicates a new cosmological effect.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: "Indication of anisotropy in electromagnetic propagation over cosmological distances" is a well-done article reporting a systematic angle difference between the polarization of radio waves from distant galaxies and the long axis of the elliptical optical images from those galaxies. The polarization axis passes through the Earth from

Serpens to Aquila, supporting the Earth's central position in the universe. The observed axis is due to the ether flow.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = D

CMB Quadrupole-Octopole, 2002

Proposal: WMAP reveals anomalies at the largest angular scales (> 60°): (1) the vanishing of the angular two-point correlation function; (2) undersized quadrupole and octopole moments, both very planar and aligned; (3) all minima and maxima fall on a great circle on the sky; (4) the low multipoles are inconsistent with a Gaussian normal distribution; (5) they have strong correlation with the solar system ecliptic and the CMB; (6) all patterns have a high level of statistical significance (>99%); (7) becoming more likely that the large scale microwave sky has a local cause.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: So, the latest CMB analysis shows unexpected correlations of low multipoles with the ecliptic and galactic plane! The measurement does not agree with the generic prediction of a random, statistically isotropic sky from Big Bang inflation theory. Instead, there is a totally unexpected symmetry for what should be a map of the cosmos, not of the local structures. This finding is non-trivial, casting doubt on the standard cosmic interpretation of the lowest-l multipole correlations from the sky map temperatures. Uncertainty also surrounds the Big Bang claim that the first stars formed very early in the history of the universe.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = D

Galaev, 2002

Proposal: Light speed experiment to first order in v/c, based on viscous gas movement in tubes.

Summary: Geocentric = N, Heliocentric = N, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: Ether verification and measurement of velocity and viscosity with millimeter radio waves, by the gas phase method. Demonstrates ether exists, is dynamic, has viscosity, a cosmic source, and depends on latitude and altitude. Earth exhibits NO orbital motion. Simply put, virtually all these results conflict with Special Relativity and General Relativity theory. No response by Relativists to this recent disproof has been published yet.

Summary: Geocentric = S, Heliocentric = D, Ether = S, Special Relativity = D, General Relativity = D

Pioneer 10-11 Anomaly, 1972-2204

Proposal: The speed of light in deep space may not be *c*, based on the Pioneer probes. Their radio signals contain an "anomalous" Doppler shift, attributed to a small constant acceleration sunward. The drift is a blue shift, uniformly changing with a rate of ~ $(5.99 \pm 0.01) \times 10^{-9}$ Hz/s, or 8.0 x 10^{-8} cm/sec^2.direction: a line-of-sight constant acceleration toward the sun. distance: from ~20 to 70 AU from the sun.

Summary: Geocentric = D, Heliocentric = S, Ether = D, Special Relativity = S, General Relativity = N

Geocentric Response: The annual effect is particularly large in the excursion of Pioneer 11 out of the ecliptic plane! This is a rare opportunity to measure the ether flow outside the ecliptic. The increase in the Pioneer acceleration supports ether flow theory. The effect is due to the varying ether as the transition is made from Newtonian gravity near Earth to the intense firmament of deep space. If the anomalous radial acceleration acting on spinning spacecraft is gravitational in origin, it is not universal. It must affect bodies in the 1000 kg range more than bodies of planetary size by a factor of 100 or more, a violation of the Principle of Equivalence.

Summary: Geocentric = N, Heliocentric = N, Ether = S, Special Relativity = D, General Relativity = D

Conclusion

Since the speed of light proves not to be a universal constant, being subject to variation by daily, seasonal and other periodic effects, the credibility of Relativity should collapse like a house of cards. But there are too many with interests and egos vested in Relativity – so it is propped up with *ad hoc*, just so, and contradictory supports. But a house built on sand cannot stand the storm of contrary evidence. Nothing strikes fear into the heart of ardent relativists more than experiments that detect "sidereal" variations in terrestrial measurements. The logic is terrifying: How can the stars produce periodic waves every 24 hrs – 4 min if not moving themselves at that rate? If it is the sun's gravitational force lines that we rotate through each day, it should repeat exactly every 24 hours, not 23 hours and 56 minutes. What an important 240 sec! Present popular theories regarding the rotation of the Milky Way Galaxy cannot be correct! Their reasoning requires our sun to be traveling in a relatively circular orbit, which means that we would have to be traveling toward a direction that is very close to 90° away from where the core of the Galaxy really is: [R.A. 17h. 45m. Decl. -29°]. That is not the case! The sun is actually traveling in a direction toward Hercules [R.A.18h Decl. +29°] at 20 km/sec (Wilson, 1911). This is about 32° away from an orbital path in the Milky Way! The crucial tests are the disproofs, the tests that rated an X in explaining the results in the foregoing charts. Using unbiased logic and no ideological prejudices (in the sense that a stationary Earth is not excluded metaphysically as an option for explanation) the tests show that the predictions/claims of:

- Heliocentrism are challenged 23 times,
- Special Relativity 40 times, and
- General Relativity 35 times.
- Geocentrism is never eliminated, in any test.

Despite this scientific analysis, the rejection of geocentrism will continue until reason returns. There are scientists today who have boldly rejected the speculation of Relativity and found, as this chapter has, that experiments consistently disprove its principles, even when wrapped in mathematical legerdemain. But they will not, they cannot, shake off the mistakes of the past until they return to the belief of the ancients in a *terra* that is truly *firma*.

"We wouldn't know truth if it jumped up and bit us in the ass. We're probably fairly good at recognizing what's false, and that's what science does on a day-to-day basis, but we can't claim to identify truth."

Steven M. Holland[342]

"…the tail is just as capable of wagging the dog in science as anywhere else."

Robert Laughlin[343]

The common idea that scientists reject a theory as soon as it leads to a contradiction is just not so. When they get something that works at all they plunge ahead with it and ignore its weak spots…scientists are just as bad as the rest of the public in following fads and being influenced by mass enthusiasm."

Vannevar Bush[344]

"It is not uncommon for engineers to accept the reality of phenomena that are not yet understood, as it is very common for physicists to disbelieve the reality of phenomena that seem to contradict contemporary beliefs in physics."

Henry H. Bauer[345]

"Hypothesis…establishes itself by a cumulative process…if you make the same guess often enough it ceases to be a guess and becomes a scientific fact."

C. S. Lewis[346]

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[342] Professor of Geology at University of Georgia to colleague Bruce Railsback. Quote personally verified by phone from Dr. Holland on Aug 8, 2007.

[343] Robert Laughlin, *A Different Universe,* 2005, p. 100.

[344] Vannevar Bush, MIT Dean of Engineering (d. 1974), attributed, not verified.

[345] Henry H. Bauer, professor at Virginia Polytechnic, "The So-Called Scientific Method," in *Scientific Literacy and the Myth of the Scientific Method*, 1992.

[346] C. S. Lewis, *The Pilgrim's Regress*, 1958, p. 37.

The ALFA Model

Absolute Lab Frame & Flexible Aether

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This paper challenges dissidents to escape the mainstream cage of theories imposed by fiat and adopt a science epistemology based on consistent logic and the scientific method of empirical proof by falsifiability. The Fizeau and Sagnac results will be revisited and analyzed afresh to reach two conclusions that shake the foundations of belief in cosmic architecture and composition. The Absolute Lab frame and Flexible Aether model will be shown to be consistent and supported by all experiments examined to date. This support includes tests that extend Sagnac to linear motion and mechanics, the key results of Michelson & Morley/Gale, and classic aether tests. Establishment claims that support the Earth's rotation, revolution and translation will be subjected to logic and the scientific method. Consequences of the ALFA paradigm will be outlined.

1. Introduction

1.1. The Dissident Paradox

Even though the inconsistency of SR is evident immediately from its two premises, yet the discussion of contradictions is allowed to continue further, in violation of Popper's scientific logic rules.

For example: photon speed is constant in any frame x ,

SR axiom 2: $V_{\text{ph},x} = c$ (1)

(c is light speed in vacuum).

All objects are stationary in their own frames, with respect to themselves, in their own proper frame.

Null axiom $V_{x,x} = 0$ (2)

But if x is the photon frame, then $v_{\text{ph,ph}} = 0$ for the null axiom and $v_{\text{ph,ph}} = c$ from axiom 2.

1.2.Handling Inconsistency

The consequence of ignoring this contradiction is that testing is useless, since anything can be proven true or false in an inconsistent system. To illustrate, just foolishly add the axiom:

$$1 = 2$$

to the valid and consistent rules of arithmetic and behold what mayhem is generated by the inconsistency. When this system proves that

$$x = y$$

for any x, y, the reason is that the inconsistent axiom was allowed. By adding

$$\begin{array}{r} 1 = 2 \\ +2 = 1 \\ \hline 3 = 3 \end{array}$$

the possibility of using two false statements to prove a truth is demonstrated. This example corresponds to dissidents who ignore the SR axiomatic conflict and allow establishment arguments over SR logical conflicts and implementation details and interpretation of SR rules to persist. Just as the inconsistent arithmetic system can prove that $1 = 1$, $2 = 2$ and $1 = 2$, mainstream science can prove any empirical test of SR is valid, because its basic rules conflict.

Relativity claims of experimental support are meaningless; the logical inconsistencies of SR and GR allow any test to prove them true…. or false.

Our epistemology follows the scientific method and logic:

When a contradiction is found, STOP!!

a. abandon the theory, or
b. eliminate the contradiction

Why? Accepting contradictions allows anything to be proven true

⇨ nothing can be proven true

Modern science (MS) claims that relativity predicts the correct results for all experiments. This is true. Relativities also predict different results for all tests!

1.3. Clues to SR Rejection

Those who question the relativity principle have no concept of the signs that mark its invalidity – of how to recognize a preferred/absolute frame. If relativity is true:

Start with a relative displacement between 2 objects, a and b:

$$D_{a,b}(t) = -D_{b,a}(t) \tag{3}$$

The rate of change of each side gives the condition for relative motion/velocities

$$V_{a,b}(t) = -V_{b,a}(t) \tag{4}$$

Repeated derivatives generate higher order motions, like

$$A_{a,b}(t) = -A_{b,a}(t) \tag{5}$$

(Note that accelerations are relative, not absolute, as some relativists claim – just another inconsistency).

Now, if the relativity principle is false, there must be at least one case where

$$V_{a,b} \neq -V_{b,a} \tag{6}$$

that marks the existence of a preferred frame. E.g., if *a* is the photon frame 'ph' and *b* is any inertial frame 'in', then

$$V_{\text{ph,in}} = c\,. \tag{7}$$

But $V_{\text{ph,in}} = ?$ It's undefined. Measurements can't be made from the photon frame, a violation of the scientific method's falsifiability criterion. (except for Einstein, whose gedanken experiments replace real testing.)

In addition, if an absolute frame *abs* exists, then $V_{a,b}$ must use $V_{a,\text{abs}}$ to correspond with experimental tests. We then can detect an absolute reference system by looking for.

$$V_{a,b} \neq -V_{b,a} \tag{8}$$

$$V_{a,b} = V_{a,\text{abs}} \tag{9}$$

1.4. Another Relativity Show Stopper

A dropped ball with mass *m* hits the ground at speed $V_{m,\mathrm{e}}$ and energy $½mV_{m,\mathrm{e}}^2$ measured in the Earth's frame. In the m frame the Earth hits the mass with energy $½M_\mathrm{e}V_{\mathrm{e},m}^2$.

Conservation of energy requires that

$$½mV_{m,\mathrm{e}}^2 = ½mV_{\mathrm{e},m}^2 \tag{10}$$

But relativity requires that $V_{m,\mathrm{e}} = -V_{\mathrm{e},m}$, so m must equal M_e, which is 10^{25} times bigger!!

Only the speed in the earth frame is logically consistent with physical laws (energy) and real; the speed in the ball frame is phenomenal… an appearance. Relativity contradicts conservation of energy… the earth frame does not.

Another characteristic of relativity violation is found in dynamic laws that have a velocity dependence, terms that are functions of *v*, or $F(v)$.

Objects at rest in a dynamically preferred frame will have $v = 0$, and the equations of motion will have their simplest form. E.g., in mechanics the centripetal force

$$F_c = \frac{mv^2}{r} \tag{12}$$

will be zero when the mass is at rest in the preferred frame.

In EM the Lorentz force will only have an **E** field contribution, When the charge q is at rest in the preferred frame,

$$\mathbf{F}_L = q(\mathbf{E} + \mathbf{v} \times \mathbf{B}) = q\mathbf{E} \tag{13}$$

Dissidents clamor for originality, for thinking outside the box, but does this box contain logic and testing? Many adopt the rejection of the scientific method, as does mainstream physics. All with similar thoughts should stop reading here, for this paper adopts the traditional scientific method of investigation, based on:

- **Testability:** capable of being falsified by a test here and now
- **Consistency**: no contradictions in premises, test or meaning. If you have a problem with these two criteria, then don't bother reading further. Subjective dislike of a theory is not a scientific argument.

1.5. The Aether Model

During the 1800's most physicists believed that a fundamental substrate pervaded all space, an elastic medium allowing the propagation of light, namely the EM aether. Its nature was modeled after the properties of sound in fluids like water and air.

We will adopt a general model so as not to eliminate initially any empirically testable model. **Aether phases** may be of three types:

1. solid like ice, a grid or rigid lattice (Lorentz, M&M)
2. flexible passive, dragged by material motion, like water entrained by paddle or propeller
3. flexible active, having a natural flow, like a river, the Jet or Gulf streams

For the last two types, the interaction coupling between aether and matter/particles can be partial or full. The last option of a natural aether flow is most often overlooked by modern analysts, who resort to aethereal euphemisms like quantum foam, vacuum, dark matter or zero point energy.

1.6. Aether Motion Testing

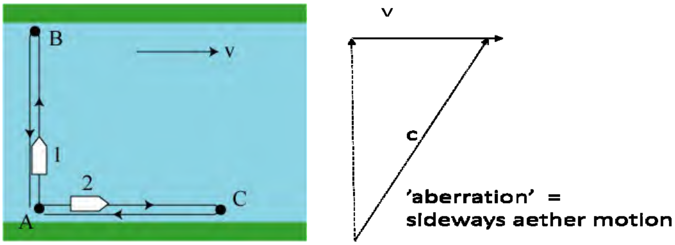

Fig. 1. OWLS / TWLS - One Way Light Speed vs. Two Way Light Speed

We will use the aether model of 150 years ago. A boat (photon) moving in a river(type 3 aether) can simulate interaction of photons and an aether flow moving at speed v .

A boat (Fig. 1 left,#2) can move at speed c in still water, so it moves downstream at $c+v$ and upstream at $c-v$. Measurement of the roundtrip speed along A-C-A (TWLS) will not detect the aether speed v , since

$$\frac{c+v}{2}+\frac{c-v}{2}=c\ .$$

Only an OWLS test will detect aether speed v parallel to the light beam.

Conclusion: All TWLS tests of light speed in parallel aether flows are worthless and claims of isotropy of c with high precision lasers (or vacuum interferometers) are bogus.

Fig. 1 as drawn is incorrect, since boat #1 would be deflected to the right (downstream) while crossing. The right diagram does show what aberration to expect from the moving medium's (water/aether) effect on the boat/photon, an aberration angle of $\sin^{-1}(v/c)$.

The speed of photons perpendicular to the aether current is

$$\left(c^2 - v^2\right)^{1/2} = c\left(1 - \frac{v^2}{c^2}\right)^{1/2} \approx c\left(1 - \frac{2v^2}{c^2}\right).$$

It's this change in c of order v^2/c^2, due to the aether cross-current, that Michelson and Morley sought to measure.

2. Early Aether Tests

Some aether detection tests were designed to be so; others were serendipitous.

2.1.Arago Prism Telescope (1810) [1]

Arago attempted to measure starlight refraction with a glass prism in a telescope (Fig. 2). According to Snell's law angles of refraction would depend on c and the different velocities of the stars and the motion of the earth at different times of the day and year. The angle of refraction will be different for light moving at different speeds. Contrary to this expectation he found there was no difference in refraction between stars, at differing times of day or between seasons. Light from every star is refracted the same.

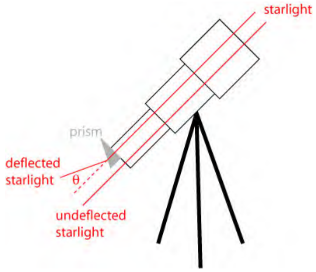
starlight
prism
deflected starlight
θ
undeflected starlight

Fig. 2. Arago prism telescope

Conclusion: Light speed *c* is independent of stellar (source) and earthbound (observer) motions.

2.2. Faraday Rotor Generator (1831) [2]

Faraday found there is an induced current if a conductor and a magnet are joined together and rotated, having no relative motion, but both spinning in the lab frame. This is contrary to Faraday's and Maxwell's laws.

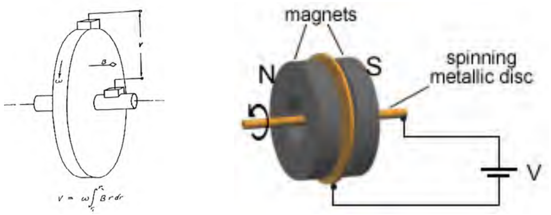
magnets
N
S
spinning metallic disc
V

Fig. 3. Faraday Rotor Generator - schematic (left) and physical set-up

Conclusion: The Hertzian EM equations predict this result, if the convective velocity is the speed of aether in the lab $V_{\text{ae,lab}}$.

2.3. Fizeau Water Pipes (1861) [3]

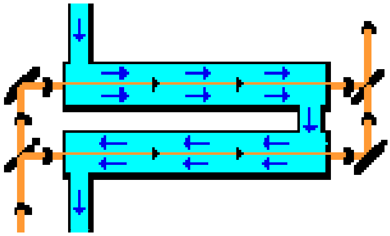

Fig. 4. Fizeau water pipe

Fresnel proposed in 1818 that matter moving at v would partially drag aether along, reduced by the drag factor $1-1/n^2$. The Speed of Light v_{SoL} for this case is Fresnel's Law:

$$v_{SoL}=\frac{c}{n}+v\left(1-\frac{1}{n^2}\right) \tag{14}$$

Fizeau tested and confirmed the Fresnel conjecture by splitting a beam and sending the half beams through water moving in opposite directions with speeds $+v$ and $-v$ (Fig. 4). The half beams were recombined and compared in an interferometer. Fresnel's law showed aether is dragged with water/ matter at a greatly reduced speed.

Note that if a vacuum is used, where $n=1.0000$, no dragging will occur; v_{SoL} will be c. It is hopeless to test for c anisotropy with a vacuum, as there is no mass for the aether to interact with. Yet such vacuum experiments are cited by MS scientists as proof of SR's second axiom, and the non-existence of aether.

Also, note that the aether motion is measured within the dragging medium, not outside it, as in the Sagnac test, which shows no reduction in v_{SoL}. Another important note, for future reference in the Sagnac test, is the understood reference frame for Fizeau's experiment the lab frame!

Conclusion: v_{SoL} is composed of two terms, one which depends only on the refractive index n, and the other is dependent on both n and v.

2.4.Airy Water Telescope (1871) [4]

Airy put water in the telescope and saw no change in aberration angle. This was termed a 'failure', since Bradley's theory of receiver motion predicted a change with n.

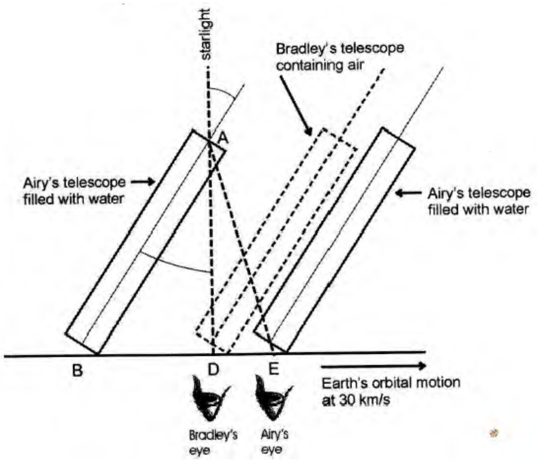
starlight
Bradley's telescope containing air
A
Airy's telescope filled with water
Airy's telescope filled with water
B
D
E
Earth's orbital motion at 30 km/s
Bradley's eye
Airy's eye

Fig. 5. Airy water telescope

Bradley – For all dashed lines in Fig.5: The middle telescope must be tilted to see the starlight's aberration. When light moves through the telescope from A to D the Earth – and telescope - move from B to D. This determines the aberration angle of tilt,

$$\tan^{-1}\frac{\mathrm{BD}}{\mathrm{AD}}.$$

Airy – solid lines: With water added (left telescope), the light travels the distance AD through the telescope slower, at ¾ of *c*.

So the telescope travels further at the Earth's orbital speed, a distance BE, and the aberration is greater, $\sin^{-1}(\mathrm{AD}/\mathrm{BE})$. Nice theory, but fails to predict the actual result, shown in the right telescope – there's NO CHANGE in the tilt! The Earth's motion as cause of aberration is simply refuted by Airy's test – the 'failure' to increase aberration with water.

Airy's 'failure' is in reality a 'success' for the ALFA model, where the flexible aether's sidereal rotation explains that the deflection occurs in transit. The light path is bent in space, before entering the telescope, while the Earth is at rest.

ALFA analysis: There are no D and E distances, since the Earth is motionless. The light beam in water travels slower, at $3/4$ of *c*, from A to B, but there's no sideways motion. So no additional tilting is needed. Airy's test is an ALFA success!

Conclusion: The Earth's motion as cause of aberration is simply refuted by Airy's test – the 'failure' to increase aberration with water. The deflection of starlight known as stellar aberration must occur BEFORE the light enters the scope.

2.5.M&MX (1886) [5]

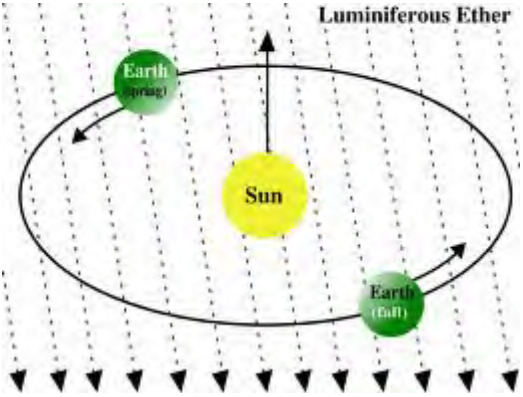
Luminiferous Ether
Earth
(spring)
Sun
Earth
(fall)

Fig. 6. Earth's annual motion through aether

For a fixed aether, both a daily and annual periodic change in aether direction is forecast, based on the heliocentric model in Fig.6. The annual change is due to the orbital speed of the Earth and is 30 times greater than the equatorial spin.

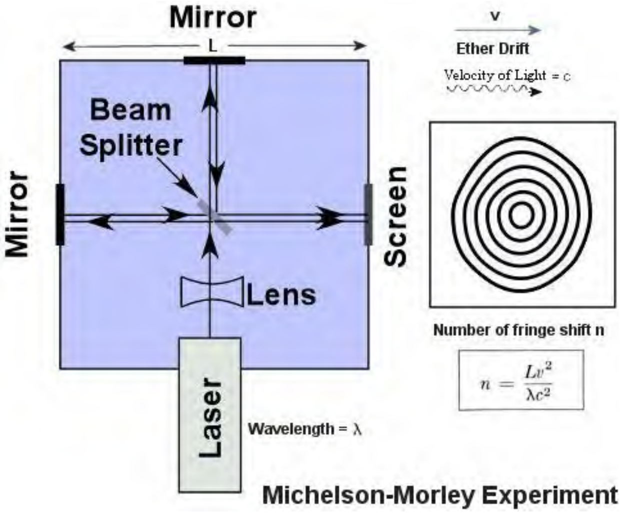
Mirror
L
v
Ether Drift
Velocity of Light = c
Beam Splitter
Mirror
Screen
Lens
Laser
Wavelength = λ
Number of fringe shift n
$n = \frac{Lv^2}{\lambda c^2}$
Michelson-Morley Experiment

Fig. 7. M&MX - apparatus schematic (left) and screen pattern

The aberration boat model can be conceptually transferred to the motion of a photon up/down an aether stream with motion cross-stream. In the diagram above a beam split into 2 half beams at a right angle is then compared for a phase difference when combined on the interferometer screen.

The result was equivalent to a speed of ~ 5 kms, about 15% of the expected orbital speed of 30 km/s. The disappointment was reflected in the summarizing term – a 'null' result.

The experimental error analysis of 5 runs in Fig.8 shows that the M&M SoL average was always greater than c , and only one set of error ranges overlapped the value of c . Although this result is consistent with an Earth and an aether approximately at rest, this option was not listed among the four options for interpretation given in Michelson's conclusion.

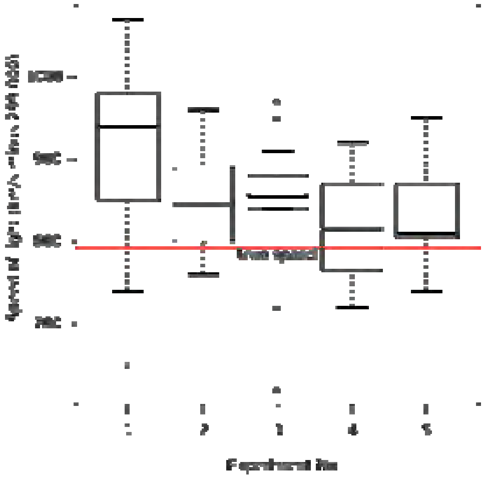

Fig. 8. Box plots from the Michelson–Morley experiment

The search for the aether effectively ended with Einstein's paper on SR in 1905. Albert E said no aether was needed, while Albert M ignored the Earth and aether at rest! Note: this experiment is small-scale and low precision; the use of transverse flow means the accuracy is of second order $\sim(v/c)^2$.

Conclusion: There is no aether, or the Earth and aether are co-moving.

3. Review of Sagnac-type Tests

3.1.Sagnac (1913) [6]

In the Sagnac test an interferometer that detects the overlapping pattern of two counter-rotating light beams resulted in a measured Speed of Light v_{SoL} that was the usual light speed c plus or minus the rim speed of the spinning platform v.

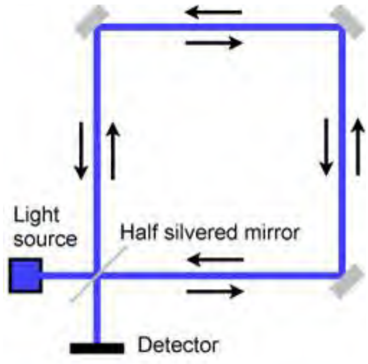

Fig. 9. SagnacX schematic

The light beam in Fig. 9 was split into CW and CCW paths that combined again at the interferometer detector for fringe measurement; the entire apparatus was mounted on a turntable. Sagnac found that $v_{SoL} = c$ when the speed of the rotor in the lab frame was zero. But when the rotor's edge speed was v, $v_{SoL} = c \pm v$.

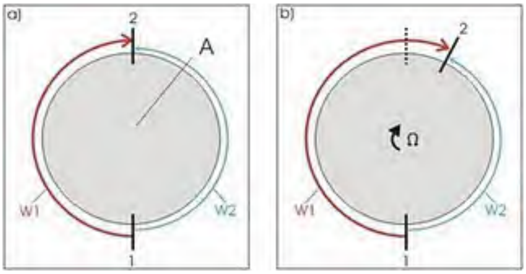

Fig. 10. Optical bench at rest and then rotating CW

When the platform is at rest (Fig.10 left) the CW w_1 and CCW w_2 half-beams travel the same distance in the same time. But when the platform spins CW (Fig.10 right) the co-rotating w_1 beam travels a greater distance than the counter-rotating w_2 beam, in the same time. Were the photons replaced with human runners, the result would be the same - the CCW runner would win the race.

In SR v_{SoL} for either beam must be c in either the lab or rotor frame, whether the rotor spins or not. In the rotor frame, the light beam should see no rotation, because the whole optical bench rotates: source, mirrors and film are on the turntable. Measurements are made in the rest frame of the apparatus which is only rotating in the lab frame. Relativity says v_{SoL} should be c , but Sagnac measures

$$v_{SoL} = c \pm v \tag{15}$$

v_{SoL} is anisotropic - it is not c in the rotating frame!

Sagnac considered that the turntable rotation dragged or entrained the aether in the space around it, at the same speed (full dragging) as the rotor v. The v_{SoL} change was due to the motion of the aether in the path of the light beam, either boosting it $+v$ for co-rotation or $-v$ for counter-rotation. He then concluded that v_{SoL} was independent of the source speed, and that an entrained aether was detected, explaining the unexpected results, that is, to relativists. Incredible as it may sound, although the results had found that counter-rotating light beams travel at $c \pm v$, relativists actually delude themselves that the Sagnac change in v_{SoL} is consistent with SR! Their idol, Einstein himself, chose to ignore the results that contradicted his 1905 paper – even 40 years later he had no adequate response. Einstein was quite aware of Sagnac's work, but chose to ignore the refutation and hope the Sagnac result would be forgotten. But for its use in optical navigation and GPS, it no doubt would be.

3.2.Sagnac Analysis of Light Speed

Note: SagnacX is first order in v/c. The complete Sagnac result in transparent dielectric having index of refraction n is

$$v_{SoL} = \frac{c}{n} \pm \frac{v}{n^2} \tag{16}$$

We simplify the analysis by considering only the fast co-rotating beam, the plus sign, and suppress the factors involving *n*. (The full expression can be restored at the end.) So v_{SoL} is simplified to

$$v_{SoL} = c + v \tag{17}$$

In both the lab and rotor frame (for the co-rotating beam).

Sagnac found the result was independent of both source and detector speed and the aether was being dragged along at the speed of the rotor.

Note: the lab frame measurement of $c+v$ was not recorded by Sagnac but reported by Dufour & Prunier in 1938. They also found that:

- The same result was found by mixing of optical parts between lab and rotor.
- The effect extended at least 10 cm from the rotor.
- The optical path must include the rotation center, else $v_{SoL} = c$

4. The ALFA Model

4.1.Absolute Lab/Dynamic Aether

The metaphysical premises are:

1. Light speed in aether is always c (c/n in dielectric)

$$V_{\text{ph,ae}} \equiv c \tag{19}$$

where 'ph' represents a photon, 'ae' is aether.

2. Galilean velocity addition is valid: (based on Fizeau's exp.) The Speed of Light in any frame x is

$$\begin{aligned} v_{\text{SoL}} &= V_{\text{photon,aether}} + V_{\text{aether,reference system}} \\ &= V_{\text{ph,ae}} + V_{\text{ae},x} = c + V_{\text{ae},x} \end{aligned} \tag{20}$$

Various theories are now applied to the Sagnac result and their predictions are compared to the Sagnac result. For all models, the measured rim speed of the rotor is *v*, so

$$V_{\text{rot,lab}} = v \tag{21}$$

Special Relativity is based on no aether and two axioms:

SR1: $$V_{x,y} = -V_{y,x} \tag{22}$$

SR2: $$V_{\text{ph},x} = c \tag{23}$$

Applying SR1 to v_{SoL} gives $V_{\text{ph},x} = -V_{x,\text{ph}}$. But $V_{x,\text{ph}}$ is untestable using the scientific method.

SR2 predicts lab and rotor frames will both measure c, but the Sagnac result is $c + v$ for both. Both axioms are invalid! *There must be some preferred frame in which* $V_{x,y} \neq -V_{y,x}$! Ritz ballistic claims v_{SoL} depends on the emitter's speed. Invalid! Sagnac found v_{SoL} is independent of source speed.

Aether theories are separated into static and flexible. For **Static Aether** type 1:

$$V_{\text{ae,lab}} = 0\,; \qquad V_{\text{ae,rot}} = 0 \tag{24}$$

By Eq. (20) $$v_{\text{SoL}} = V_{\text{ph,ae}} + V_{\text{ae,lab}} = c + 0 = c \tag{25}$$

And $$v_{\text{SoL,rot}} = V_{\text{ph,ae}} + V_{\text{ae,rot}} = c + 0 = c \tag{26}$$

Both rigid aether predictions conflict with Eq. (18). For **Dynamic Aether** type 2 with full dragging:

by measurement $$V_{\text{rot,lab}} = v \tag{27}$$

by assumption $$V_{\text{ae,lab}} = v \quad \text{and} \quad V_{\text{ae,rot}} = 0 \tag{28}$$

The rotor frame sees a co-rotating aether. v_{SoL} in the lab in Eq. (20) $= V_{\text{ph,ae}} + V_{\text{ae,lab}} = c + v$ agrees with Eq. (18). The rotor $v_{\text{SoL,rot}} = V_{\text{ph,ae}} + V_{\text{ae,rot}} = c + v$ from Eq. (18) implies $V_{\text{ae,rot}}$ must equal v, in conflict with the assumption of full dragging,

$$V_{\text{ae,rot}} = 0 \tag{29}$$

Can $V_{\text{ae,rot}} \neq 0$ so that aether speed $= v$ in both frames?

Before rejection this as a dead end, recall that SR was refuted, so a preferred frame must exist. If $V_{\text{ae,rot}}$ is v, not 0, then the lab frame must be preferred for detecting aether motion! $V_{\text{ae,lab}}$ and $V_{\text{ae,rot}}$ both equal v!

From the results Eq. (18) and velocity analysis,

$$V_{\text{ae,rot}} = V_{\text{ae,lab}} + V_{\text{lab,rot}}$$

implies by substitution that

$$v = v + V_{\text{lab,rot}} \tag{30}$$

which further implies that

$$V_{\text{lab,rot}} = 0 \neq V_{\text{rot,lab}} = v \tag{31}$$

In the rotating frame the lab is at rest! If relativity were true $V_{\text{lab,rot}}$ would equal $-v$, not 0. As the rotor can have any speed the result is general.

4.2.Absolute Rest Theorem

$$Vlab,x=0 \tag{32}$$

where x is any rotating frame on Earth. The lab is always at rest with respect to any rotating system. The Earth is the frame of absolute rotation sought by Newton and rejected by Einstein. With $V_{\text{ae,rot}} = v$, Flexible Aether predictions agree with Eq. (18).

Conclusion: Only the Absolute Lab (ECEF) frame with Flexible Aether model $V_{\text{ae,rot}} = v$ agrees with Eq. (18).

$$v_{SoL} = c + v \tag{33}$$

in both frames (and with similar tests: M&MX, R. Wang, Dufour & Prunier, etc.)

The SoL is $c + v$ for the co-rotating beam, in both the lab and rotor frames, independent of source and detector motion, *but dependent on aether motion*.

4.3.Summary of Sagnac Results

$$v_{\text{SoL},x} = V_{\text{photon,aether}} + V_{\text{aether},x} = c + V_{\text{ae,lab}} \tag{34}$$

from Eq. (32). So whatever reference frame x is used, light speed only depends on the aether speed in the lab frame.

$$V_{\text{photon,aether}} + V_{\text{aether,lab}} = c + V_{\text{ae,lab}} \tag{35}$$

4.4.Absolute Time

Newton had an abstract concept of absolute space and time, though neither could be defined concretely for measurement. Does the absolute frame of ALFA have a corresponding well-defined absolute time…capable of being tested?

The conditions for having an absolute time-keeper are:

- Stable
- Global synchronization
- Autonomous operation
- Universal accessibility across the world
- Immunity from environmental changes

There is really only one clock that fills all these slots – the most ancient of time-keepers, the heavenly procession of the stars – astronomical star time! Stellar rotation provides a universal master clock in the time domain.

Clones of the master clock – or slave clocks – can be used just as now, as long as they are monotonic and can be scaled up to the master clock in the heavens. This resolves time dilation issues. Cosmic time is free of local influences and is truly universal, the sky being accessible anywhere on Earth.

The ALFA model axioms are:

1. Light speed in aether is always c =>

$$V_{\text{photon,aether}} = V_{\text{ph,ae}} = c \tag{36}$$

2. Absolute velocity addition: (lab = ECEF frame)

$$v_{\text{SoL},x} = V_{\text{photon,aether}} + V_{\text{aether,lab}} = c + V_{\text{ae,lab}} \tag{37}$$

3. Absolute Rest theorem:

$$V_{\text{lab},x} = 0 \tag{38}$$

   The lab/Earth is universally at rest.

4. Absolute Frame theorem:

$$v_{SoL,x} = c + V_{\text{ae,lab}} \tag{39}$$

   Whatever reference frame x is used, light speed only depends on aether speed in the lab frame.

5. Absolute time:

$$T_{\text{lab}} = T_x \tag{40}$$

   measured with the aethereal motion of the stars, or 'cosmic time'.

5. More Empirical Support

5.1.M&M Redux

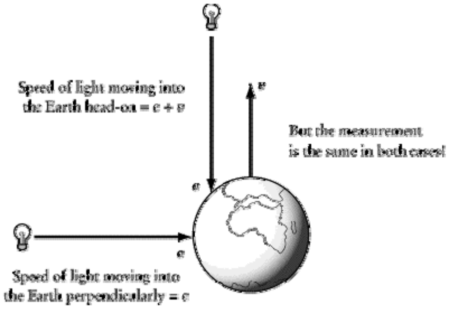
Speed of light moving into
the Earth head-on = c + v
v
But the measurement
is the same in both cases!
c
c
Speed of light moving into
the Earth perpendicularly = c

Fig. 11. Predicted light speed for motion parallel and orthogonal to Earth's motion

Let's all concentrate. Is there any value of Earth's speed v for which c does equal $+v$? All the establishment super-stars for over a century couldn't get this right!

From Eq. (2): $$v_{\mathrm{SoL,lab}} = c + V_{\mathrm{ae,lab}} \qquad (41)$$

from 'null' result:

$$v_{\mathrm{SoL,lab}} = c + \square\, 0 \qquad (42)$$

implies $$V_{\mathrm{ae,lab}} = 0 \qquad (43)$$

The aether speed is approximately zero at the Earth's surface, so both the Earth and the surface aether speed are zero (within the M&MX precision limits - MMX is second order in $(v/c)^2$; Sagnac is first order in v/c. *ALFA* explains the null result as a motionless Earth and aether.

5.2.Michelson-Gale (1925) [7]

Counter-rotating half beams traversed a 1.2 mile perimeter in an Illinois field (Fig. 12, right). There should be a phase difference arising from the difference in rotation speed between the north and south leg, where $v_1 > v_2$. The result indicated a difference corresponding to a daily eastward rotation, which Mic-Gale misinterpreted as the Earth's rotation, since Sagnac's result showed the Earth doesn't rotate. Besides ignoring the possible aether rotation westward around a static Earth, detection of Earth's rotation by the light beam requires an aether medium.

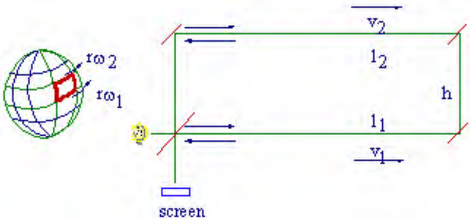

Fig. 12. Michelson-GaleX – location and schematic

Test result:

$$v_{\mathrm{SoL}} = c + r\omega = c + v$$

where r is the distance to polar axis, and ω is the sideral angular velocity

From Eq. (2) $v_{\mathrm{SoL\text{-}lab}}$ $v_{\mathrm{SoL\text{-}lab}} = c + V_{\mathrm{ae,lab}}$ (44)

from the test result $v_{\mathrm{SoL\text{-}lab}} = c + v$ (45)

implies $V_{\mathrm{ae,lab}} = v$ (46)

$v =$ aether flow near the ground

Conclusion: The Earth has an autonomous aetherosphere that rotates westward at every latitude in one sidereal day. The aether here is flowing naturally, not passively being dragged, a proof of existence of type 3 active aether currents, the analog of rivers or the Jet and Gulf streams. Other cases of type 3 flow are the GPS "Sagnac" effect and the E-W radio signal delay.

5.3.Dufour & Prunier (1937) [8]

… extended the Sagnac study with much the same equipment. They found the same results as Sagnac did, but with important additions.

Conclusion: v_{SoL} in the lab frame is the same as in the rotor frame.

$$v_{\mathrm{SoL}} = c \pm V_{\mathrm{ae,lab}} \tag{47}$$

$V_{\mathrm{ae,lab}} = 0$ if the light path doesn't include the rotor's center, and is unchanged up to 10 cm above the rotor surface. (Unfortunately this was not extended to find the range of aether drag by the rotor.)

Aether is dragged around the rotor at the same speed. The aether speed in any frame is the same as the lab frame.

5.4.Ruyong Wang FOC (2005) [9]

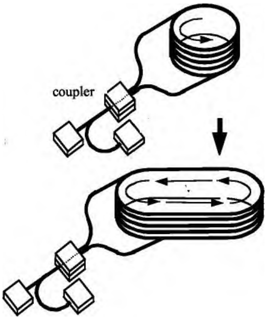

Fig. 13. Converting a FOG into a FOC

Strictly interpreted, the SagnacX only applied to rotational dragging of aether. But Wang showed the same result is found when aether is dragged in a straight line.

The Sagnac setup is improved by using fiber optics instead of mirrors to form the optical path and amplify the timing difference by using multiple coils – the Fiber Optic Gyro - FOG (Fig.13 top). Then the loops are distorted into a racetrack oval to create linear sections (Fig.13, bottom).

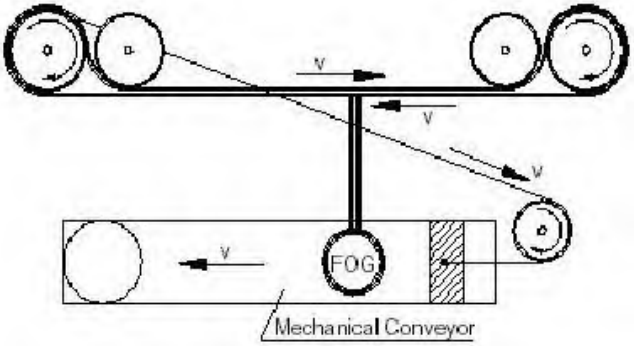

Fig. 14. Fiber Optic Conveyor - FOC

The bold line is the optical path/fiber which corresponds to the Sagnac rotor frame. The light diagonal line is the conveyor cord. The FOG apparatus is mounted on a FOC and records the change in

SoL as the system moves linearly with speed v, dragging aether with it (Fig.14).

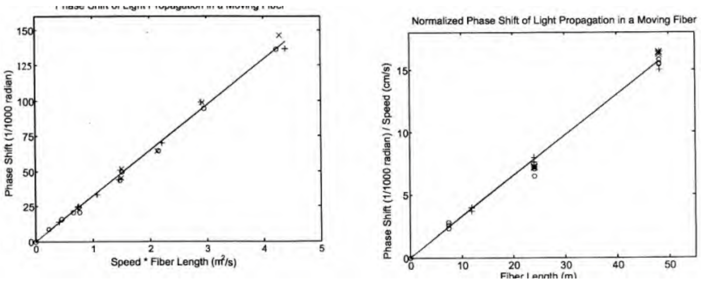

Fig. 15. The phase shift (y) is proportional to optical path length and conveyor speed (x).

$$\text{Phase shift} \sim v_L \qquad (48)$$

This is consistent with the Sagnac cocept of matter dragging aether, which causes the observed change in v_{SoL}. Going unnoticed by Wang is the outstanding evidence in this experiment of the motionless Earth. The graph clearly displays the zero speed in the lab frame, when MS mavens have the Earth rushing in various directions, around the Milky Way center, toward the Virgo cluster, etc.

Conclusion: The ALFA model is not restricted to photons in rotating aether, but also holds for aether in linear motion - that is, to all aether motions.

5.5. The Universal ALFA

The Sagnac effect has also been applied to matter-waves – Ca atoms, neutrons and electrons [10]. The ALFA formula for light speed,

$$v_{\text{SoL}} = c \pm V_{\text{ae,lab}} \qquad (49)$$

is replaced by

$$v_{\text{SoM}} = V_{m,\text{ae}} + V_{\text{ae, lab}} = V_{\max} + v \qquad (50)$$

where v_{SoM} = Speed of Matter, $V_{m,\text{ae}}$ = speed of mass in aether, and v = speed of aether in the lab frame. In complete generality, the

ALFA model can apply to the motion of photons or particles for aether motion in the lab frame.

Conclusion: The same effect of aether speed, whether photons or particles, whether rotational or linear, is verified. The Sagnac result is not photo-specific, but a general relationship between moving aether and objects in the lab frame.

5.6.Aberration

The aberration of light in a moving medium was demonstrated by Jones in 1971 [11]. The transverse 'Fresnel ether drag' experienced when light passes through a refracting medium moving at right angles to the original direction of the light, and confirmed indirectly by Airy's water-filled telescope experiment, has now been observed directly. A change in rotation speed from 600 to 1800 rpm of a glass disc produced a transverse displacement of 1.5$*10^{-6}$ mm in a light beam passing twice through the disc. This agrees with the Fresnel formula to within the 10% accuracy of the experiment.

Note: had Jones used a light path outside the glass, instead of inside, the displacement would have been about twice as great.

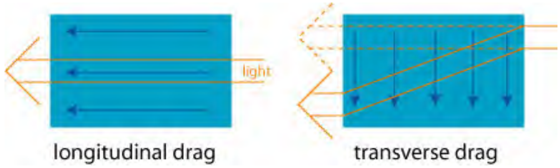

Fig. 16. Light beam direction vs. aether motion

Longitudinal drag (Fig.16 left) occurs when light passes parallel $c+v$ or antiparallel $c-v$. Transverse drag (Fig.16 right) entrains the photons sideways at an angle $\sin^{-1}(v/c)$.

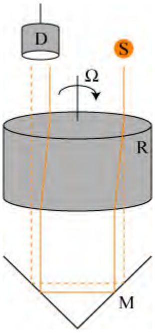

Fig. 17. The dashed line is the light path through the glass at rest into detector D. The solid line is the path with rotation Ω.

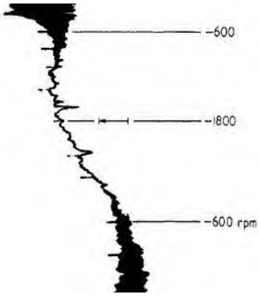

Fig. 18. Eyepiece view of beam position after passage through a rotating glass disk

Fig. 18 is the angular shift Jones saw when the glass disk's speed was increased by 1200 rpm.

Conclusion: Stellar aberration can be caused by the dragging of light by the transverse motion of aether rotation around the Earth.

5.7.Newton's Spinning Bucket

…remains a perennial puzzle for cosmology, unsolved over four centuries. Newton's belief was in evidence of an absolute space (whose origin was not specified), while Mach and Bishop Berkeley held that the bucket test showed relative rotation, the influence of distant matter on local rotation. It represents the classic clash of absolute frame and relative motion perspectives, whose arguments pro and con are still being debated.

Considered a gedanken exp. by the MS establishment, it is usually summarized by its basic features [12]. But it can easily be implemented in reality [13] – the best (and only) kind of theoretical testing. After all, why would we test theory with a theoretical experiment? By improving the protocol, using a motor-driven rotation and media other than water, hidden wave motion and nodes may be revealed, as in this link [14]. Further analysis of this experiment should reveal more key properties of the aether.

Newton believed that this experiment proved the existence of absolute acceleration and logically from this...the existence of absolute space. The significance of Newton's experiment and the logical arguments constituting his "Existence Theorem for Absolute Space" are not generally understood or accepted by mainstream physicists. Newton's concept of absolute space was not a mere assumption or premise, but rather an experimentally demonstrable property of nature.

The details of Newton's water pail experiment are summarized in the table below. Accelerations are responsible for the concave surface of the water in the pail; rotations are measured with respect to the lab.

1) start with a fully wound rope, no water or pail rotation, and a flat water surface.
2) the rope is released , the pail spins, and there is a delay before the water starts to rotate and form a vortex
3) pail and water are co-rotating , with a vortex visible
4) the rope fully winds up with opposite twists and pail stops... vortex still present

State	**Pail Spin**	**Water Spin**	**Relative Spin**	**Water Vortex**
1	No	No	No	No
2	Yes	No	Yes	No
3	Yes	Yes	No	Yes
4	No	Yes	Yes	Yes

Table of Bucket/Water states

The concave water surface can occur whether there is relative motion (4) or no relative motion (3).

The vortex appears whenever the water rotates (States 3 and 4) but not when the water does not rotate (1 and 2), regardless of relative rotation.

A vortex is only caused by the true or real absolute rotation of the water.....in the lab frame. Therefore real or absolute accelerations exist.

If acceleration is always measured to be absolute, then repeated integrations show that velocities and distances (space) must all be absolute. From the Galilean transformation it follows that if space is absolute time must also be absolute. So Newton's rotating pail test was able to show the existence of absolute space and time.

This proof agrees with the Sagnac result - that a spinning object drags aether around it at the same speed. The effect of the small pail on the water is due to the local aether set into motion; it is more significant than any gravitational effects of the Earth, Moon, and Sun.

What of the claim that there would be imperceptible tidal effects on the water surface due to the remote Moon and Sun motions? The effects of the Earth would be much greater, because it is bigger and much closer. Thus what Newton showed was that there must be relative acceleration with respect to the most significant nearby massive body, the Earth.

This is the dominant gravitational field theory. Since the Earth spins on its axis and orbits the sun which orbits the center of the Milky Way, these accelerations with respect to absolute space should have been observed… and they were not.

This misrepresents - or misunderstands - the ALFA model of a dynamic aether and an absolute fixed lab frame. The Earth is at rest in absolute space, so it is at absolute rest, the reference for all motion. Since the Earth neither spins nor orbits anything, no accelerations should be observed from the Earth..... and they were not.

5.8.Spinning Bucket Description (Simplified)

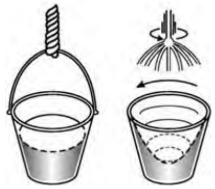

Fig. 19. Initial and final state of bucket

After twisting the supporting ropes in Fig.19, then release the bucket with a calm flat surface. Uncoiling causes the aether around the bucket – not just within the solid bucket - to rotate at the bucket's angular velocity (Sagnac measured this aether drag external to the rotor).

The aether motion is partially coupled by the Fresnel drag factor to the water, causing the water to be slowly dragged into the same rotation. Eventually the entrained water rotates at the bucket's speed and forms a vertical vortex.

Note details that support a model of entrained aether and water: There is a delay between the rotation of the bucket and the water, the inertia of the water. All of the water begins to rotate at about the same time, not spreading from the edges to the center. The bucket's spin affects all of the water, but slowly. (Fizeau found that aether is dragged by the Fresnel factor of $1-1/n^2$, or about 0.55 of the bucket speed for water.)

The solid bucket doesn't transfer mechanical energy to increase the water's rotation, because the elastic collision of the water molecules with the bucket walls causes a normal reaction force. The normal force is radial and cannot change the water's rotation.

It is in this system state that we will analyze the angular speeds in both lab and bucket frame, just as was done with Sagnac, which has been successfully analyzed above. The bucket corresponds to the rotor; water motion detects aether entrainment, as did the light beam for Sagnac.

Lab frame: centered any place on the bucket axis

$$\begin{aligned} V = V_{\mathrm{b,l}} &= \text{speed of bucket in lab frame} \\ = V_{\mathrm{w,l}} &= \text{speed of water} \\ = V_{\mathrm{a,l}} &= \text{speed of aether} \end{aligned} \tag{51}$$

Bucket frame: centered any place on the bucket axis

$$V_{\mathrm{w,b}} = 0 = \text{measured} \tag{52}$$

$$V_{\mathrm{a,b}} = 0 = \text{aether} \tag{53}$$

Since the aether spins with the bucket and the water is dragged by the aether

$$V_{\mathrm{l,b}} = -V \tag{54}$$

and the lab rotates in the opposite sense to the bucket.

But….the vortex seen in the bucket frame means the water and bucket are really rotating, although the water speed $V_{\mathrm{w,b}}$ seems to indicate that it is not moving! The lab frame is preferred for rotation measurements; the bucket frame is fictitious and invalid for applying physical laws.

To obey the laws of physics any speeds observed in the bucket frame must be replaced by the absolute lab frame data. So

$$V_{\mathrm{x,b}} = V_{\mathrm{x,lab}} \tag{55}$$

Measurement of the lab frame in any other frame must be zero, so the measured value of $V_{\mathrm{l},x}$ must be replaced with

$$V_{\mathrm{l},x} = 0 \tag{56}$$

The speed of an object in frame *x* is computed from the Galilean law.

$$V_{x,\mathrm{l}} = V_{x,\mathrm{a}} + V_{\mathrm{a,l}} \tag{57}$$

These three mechanical results in red are equal to the Sagnac analysis and consistent with an ALFA model based on EM.

Conclusion:

1. A flexible aether is consistent with the bucket result.
2. Aether can drag matter, as well as the reverse, as was seen in SagnacX and FizeauX.
3. Newton was right… almost. His vague concept of absolute space is actually the lab frame or ECEF - the absolute frame for measuring rotation of aether.

Energy considerations also show the inconsistency of relativity. In the lab frame the total energy *E* is the rotational kinetic energy of the bucket and water; in the bucket frame *E* is the rotational energy of the water, the lab, the Earth and the universe, together rotating around the bucket.

Since kinetic energy is truly zero only in the lab frame, the lab frame is reality; the bucket frame is just phenomenal.

6. Consequences of the ALFA Paradigm

- Relativity refuted.
- Big Bang fizzles.
- Cosmological Principle is found to be unprincipled!
- Aether causes QED enigmas: entanglement, Bell's theorem.
- Newton's 3 laws now include aether effects.
- Kinetic energy is anchored, with an absolute meaning of rest.
- All physical laws that involve speed must use the lab frame: Centripetal, Coriolis, Lorentz forces.
- Lorentz transforms and inertial frames and Riemannian geometry are of no physical importance.
- Mach's principle disproven – rotation is not relative.

7. Conclusion

SR is inconsistent and invalid. Aether exists, is flexible both actively and passively, and is not the absolute reference frame. For both EM and mechanical motion the laboratory or Earth Centered Earth Fixed (ECEF) is the preferred reference frame. It uses astronomical time as the absolute time base.

Responses are solicited that refute this Sagnac analysis, which concludes with the existence of a flexible/dynamic aether and the identification of a preferred frame for measuring motion – the lab/ECEF system. Please stick to objective evidence using the scientific method and logic. Subjective opposition is not scientific. In the follow-up paper, ALFA–part 2, specific details will cover the topics here and introduce more supporting experiments and explore the consequences of the ALFA paradigm.

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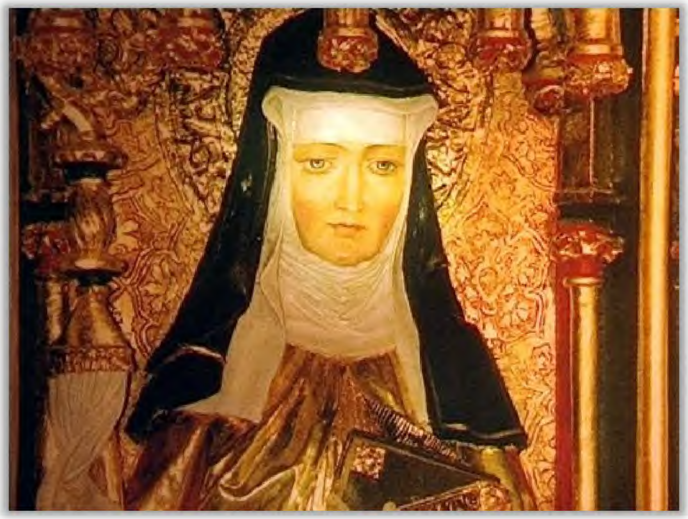
Chapter 12

Hildegardian Geocentrism: Aristotelian Cosmology Meets Modern Science

A Brief History of St. Hildegard's Life



At the beginning of the second millennium stood a woman gifted with insight into cosmology that, as we look in hindsight, seems to have far exceeded the theories of Copernicus, Galileo, Kepler, Newton, and Einstein. The woman was Hildegard von Bingen, the eleventh century German mystic and Benedictine Abbess whom some call "The most gifted woman of the epoch."[347] She was born in 1098 and died at the age of 81, in 1179. She was canonized a saint by Pope Benedict XVI on May 10, 2012 and was made a Doctor of the Church on October 7, 2012.[348] Her complete story is truly amazing, but, of course, we are only interested in her cosmological revelations.

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[347] Michael Seidlmayer, *Currents of Mediaeval Thought: With Special Reference to Germany*, 1960, p. 92.

[348] As reported by the Washington Post: "At the start of the Mass, Benedict named two new "doctors" of the church, conferring one of the Catholic Church's highest honors on the 16th-century Spanish preacher, St. John of Avila, and the 12th-

Hildegard received a series of mystical visions concerning the cosmos beginning in childhood, which became more intense in her forties. She writes:

> Up to my fifteenth year I saw much, and related some of the things I had seen to others, who would inquire with astonishment whence such things might come.

Her main visions are divided into three eras: *Scivias* (1152-1158); *The Book of Life's Merits* (1158-1163); and finally *The Book of Divine Works* (1163-1173), the last being the one we will investigate. The book was written in Hildegard's native medieval German, and its contents have been reproduced and analyzed by Dr. Helmut Posch in the book titled *Das wahre Weltbild nach Hildegard von Bingen* ("The World According to Hildegard von Bingen").[349] We are indebted to him for translating Hildegard's words and interpreting them in modern scientific terms. We will add our own interpretation to Posch's as is appropriate in accord with the scientific information we have produced in this book.

In Hildegard's visions we find one of the most remarkable treatises on cosmology ever told. It is elaborate and quite detailed. It answers many of the questions with which modern science has struggled but failed to obtain satisfying solutions. For example, Hildegard helps in explaining the nature of gravity, something that has escaped the understanding of modern science to this very day, although many theories, from Descartes' vortexes to Quantum Loop theory, have been proposed. She explains the nature of light and inertia, two other phenomena modern science has long sought to understand but without much success. She explains the nature of space and its makeup, a solution, we will see, that is diametrically opposed to the "*in vacuo*" concept used in Relativity theory, but in agreement with the pre-Einsteinian particulate model of space we have been discussing in this book. She explains the mechanics of solar and planetary movement from a Tychonic perspective (*i.e.*, the planets revolve around the sun, but the sun revolves around the Earth), over four hundred years before Tycho Brahe devised it in opposition to Galileo's solar system, and she did so in the midst of the reigning Ptolemaic system.

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century German mystic, St. Hildegard of Bingen. They join the ranks of only 33 other church doctors who have been singled out over the course of Christianity for their contributions to and influence on Catholic doctrine." (See also *Catholic News Agency*: http://www.catholicnewsagency.com/news/pope-benedict-creates-two-new-doctors-of-the-church/).

[349] Helmut Posch, *Das wahre Weltbild nach Hildegard von Bingen*, Deutsche Bibliothek – CIP – Einheitsaufnahme, Aufl. – A-4880 St. Georgen, 1998.

In the wake of Newton's and Einstein's inability to explain such mundane phenomena as why a body in motion remains in motion (inertia) or why bodies fall radially toward the center of mass, or even modern science's inability to explain the true nature of light (wave or particle), the Aristotelian postulates (*e.g.* that the Earth is the absolute standard of rest, or that no object has momentum or acceleration unless a force acts upon it, *etc.*) these remain an open and viable explanation of celestial mechanics. Stephen Hawking, for all his prejudices against geocentrism, put it well when he said:

> The big difference between the ideas of Aristotle and those of Galileo and Newton is that Aristotle believed in a preferred state of rest, which any body would take up if it was not driven by some force or impulse. In particular, he thought that the Earth was at rest. But it follows from Newton's laws that there is no unique standard of rest….Is Newton right or is Aristotle, and how do you tell?….Does it really matter whether Aristotle or Newton is correct? Is this merely a difference in outlook or philosophy, or is it an issue important to science? Actually, the lack of an absolute standard of rest has deep implications for physics: it means that we cannot determine whether two events that took place at different times occurred in the same position in space….Newton was very worried by this lack of absolute position, or absolute space, as it was called, because it did not accord with his idea of an absolute God. In fact, he refused to accept the lack of absolute space, even though his laws implied it.[350]

We can see from Hawking's assessment how important is the question of whether or not the Earth is at rest. It is no exaggeration to say that all of physics and cosmology divide right at this point. If either Aristotle, on the one hand, or Galileo, Newton and Einstein, on the other hand, took the wrong path, then all subsequent physics and cosmology produced by the party at fault must be erroneous. The stakes couldn't be higher.

Whereas Galileo, Newton and Einstein gave us only mathematical equations, Hildegard, following Aristotle, gives us the physical mechanisms behind the math. In fact, as she explains the mechanics of the universe in basic Aristotelian thought forms, she is aided by visions that provide comprehensive answers that not even Aristotle's imagination could have created. Her understanding of the cosmos advances well beyond both her ancient and modern counterparts.

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[350] Stephen Hawking and Leonard Mlodinow, *A Briefer History of Time*, 2005, pp. 22-24.

All this, of course, raises the question of how this simple woman could have known the nature of the cosmos so intimately. To our knowledge, she was never made privy to the Aristotelian library discovered in the Middle East two centuries earlier. But not only is Hildegard's use of Aristotle a phenomenon in itself, her visions often modify and correct the places in which Aristotelian physics and cosmology needed help. So elaborate and advanced is Hildegard's model of the universe that we are more or less compelled to accept that it came either partially or totally from divine sources. (If not, then we could be as quick to conclude that her visions, as the adage is commonly stated, may not be worth the paper they are written on). Her visions have explanations that any modern-day scientist would understand, even if he didn't agree with them. As such, one cannot lightly dismiss her cosmology by countering that she might have been deranged or hallucinating, for Hildegard was a well-respected intellect in her day as she engaged in all kinds of aesthetic and mind-demanding activities, from musical composition to theological writing, but she had little science knowledge that could provide the elaborate and technical explanations of the universe we find in her writings. She studied neither atoms nor gravity, yet she seems to know about both, and many other related issues, in ways at which even a modern scientist would marvel.

Some skeptic might resort to accusing her of being demonically possessed, a state of mind that somehow gave her the ability to produce all kinds of extraordinary insights. But this accusation is quickly neutralized. First, devils do not produce such technically accurate designs. Second, if one decides to open up the possibility of the preternatural to Hildegard, one consequently opens up the supernatural as well. Thus the objection loses its impact, not to mention the fact that no one in Hildegard's day, including layfolk and church hierarchy, saw any evidence in her life that would merit such a derogatory accusation. Rather, Hildegard was exhorted and authorized to publish her writings by Pope Eugenius III (1145-1153) after he had commissioned Albero of Chiny, the bishop of Verdun, to investigate her writings. Hildegard's immediate clerical authority in Mainz, Bishop Heinrich, pronounced her visions as having divine origin. As her fame spread far and wide, many prominent clerics and layman sought her wisdom, including St. Bernard of Clairvaux, St. Elizabeth of Schoenau, the emperor Frederick Barbarossa, King Conrad III, and dozens of archbishops and bishops throughout Europe. The Roman Catholic Church has "beatified" Hildegard, which is the last step toward sainthood.

Earth: The Center of Six Cosmic Layers

To no surprise, Hildegard's visions of cosmology agree precisely with the geocentric foundation laid down in Scripture; which foundation was promoted, without exception, by a consensus of the Church Fathers; continued faithfully by Thomas Aquinas and the medievals; and confirmed by papal and conciliar decrees – not something the devil would want to accommodate if he were trying to marginalize Hildegard against the patriarchs and saints of the Church.

As Hildegard would agree, if one takes Genesis 1:1-2 at face value, one must hold that the Earth was created before the sun and stars; that it is the center point of the whole cosmos, is surrounded by the firmament that reaches to the limits of the universe, and a firmament upon which waters are presently resting. Thus was the cosmology of Hildegard's visions, but with much more detail. Accordingly, as we have outlined the scientific support for a geocentric universe in the foregoing chapters, we will now consult Hildegard's visions to substantiate those facts and queries.

To begin, Hildegard's visions revealed that the Earth was in the very center of the universe, serving as the center for the compass that points north, east, south and west stretching to the edge of the universe, a universe that is finite and spherical. She revealed that the whole universe rotates around the Earth and that the Earth itself has no movement. Surrounding the Earth are six spherical layers, composed either of fire, water or air.[351] The two outer layers are composed of fire (energy). A layer underneath the fire layers is composed of "ether." The two layers nearest to Earth are composed of air, the Earth's atmosphere being closest and described as "very clean," followed by an "illuminated and humid" air layer. Above the two air layers is a water layer, which corresponds to the "waters above the firmament" recorded in Genesis 1:6-9. Hildegard writes that these waters "are material unlike the lower waters, that is, much finer and invisible to our eyes."[352] The words "finer" and "invisible" could mean that the water is extremely rarified and thus invisible, or that it is rarified and very far away from Earth and therefore not seen with the unaided eye. The corollary point seems to be that the water Hildegard has in view is not solid or liquid, but gaseous.

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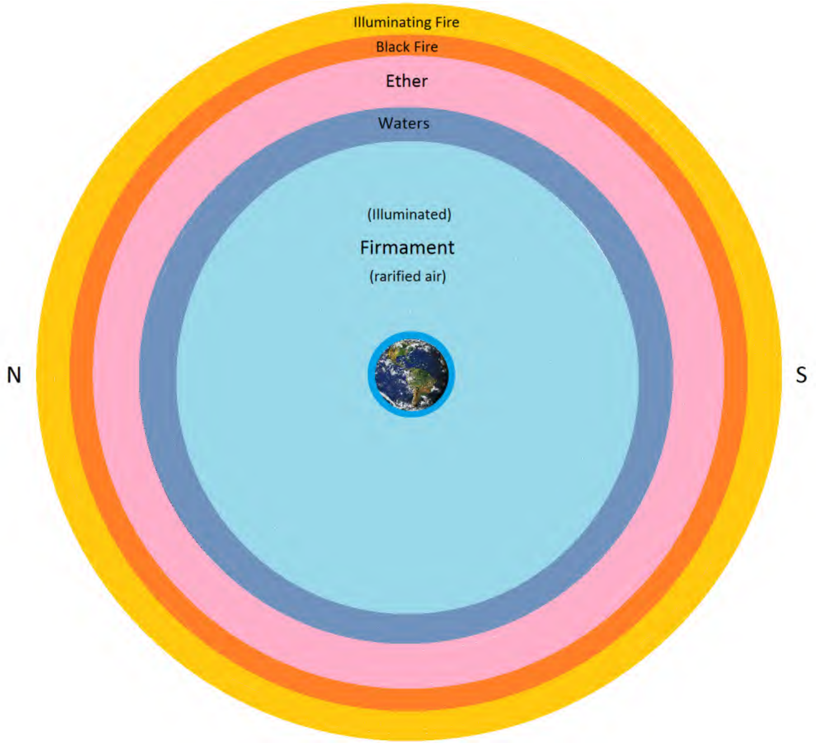
[351] Hildegard writes: "In its outer vault appeared a circle of bright Fire around the spherical wheel and immediately under it, without gap, another circle of black Fire. The thickness of the bright Fire was double of the black Fire. The two circles were linked as if they consisted of only one. Under the circle of black Fire, appeared another circle as consisting of pure ether, with the same thickness as the two other ones together. Under this ether circle there is a circle of humid Air, with the thickness of the circle of bright Fire. Under the circle of humid Air appeared another one consisting of very clear Air, which in its consistency was similar to a nerve of the human body. It was wide like the circle of black Fire. These two circles were also linked as if they consisted of only one. Under this very white Air there is also a thin layer of Air similar to some fluffy down, with dark accumulated clouds, which are divided in the whole spherical area. All these six areas were bound without an interstice. The outer circle inundated all the other spheres with its Fire, but the water area humidified all the other ones with its humidity" (*Welt and Mensch*, 35, *Das wahre Weltbild*, p. 82).



Scripture verifies that water, and the corresponding layers in Hildegard's vision, exist in these remote regions of the celestial orbs. In Psalm 104:1-6 [LXX 103:1-6], David writes:

> [1] O Lord my God, you are exceedingly great. You have put on praise and beauty:
> [2] And are clothed with **light** as with a garment. Who stretches out the heaven like a pavilion:

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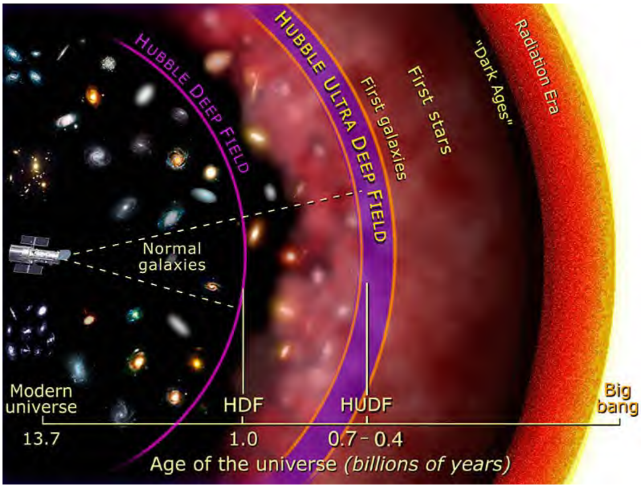
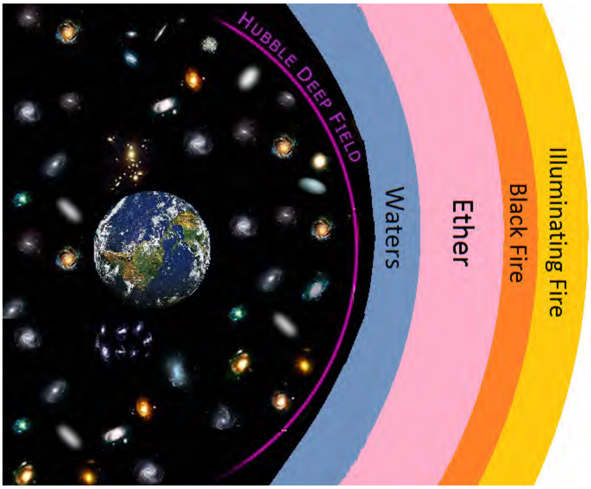
[352] Hildegard, *Die göttlichen Werke*, 56; Posch, *Das wahre Weltbild*, p. 84.

[3] Who covers the higher rooms thereof with **water**. Who makes the **clouds** your chariot: who walks upon the wings of the **winds**.
[4] Who makes your angels spirits: and your ministers a burning **fire**.
[5] Who has founded the **earth** upon its own bases: it shall not be moved for ever and ever.
[6] The **deep** like a garment is its clothing: above the mountains shall the **waters** stand.


HUBBLE DEEP FIELD
HUBBLE ULTRA DEEP FIELD
First galaxies
First stars
"Dark Ages"
Radiation Era
Normal galaxies
Modern universe
HDF
HUDF
Big bang
13.7
1.0
0.7 - 0.4
Age of the universe (billions of years)

Time-based representation of the universe by NASA


HUBBLE DEEP FIELD
Waters
Ether
Black Fire
Illuminating Fire

Space-based representation of the universe by Hildegard

The foregoing diagrams represent: (1) the Big-Bang universe of modern cosmology, which is based on the idea of a primordial explosion of indeterminate origin that expands out over 13.7 billion years and deposits matter and energy isotropically and homogeneously, and (2) the biblical view espoused by Hildegard which is based on the idea that the universe, with all its matter and energy, was instantaneously created over a six-day span and deposited systematically around Earth as the center of the distribution.

Water in the Remote Recesses of Outer Space

Prior to our present era, water in outer space was undetectable. Modern science, however, has discovered vast amounts of water in the recesses of space. As West Marrin writes:

> Water is certainly not limited by the confines of this planet and is, in fact, one [of] the most common molecules in the universe. The more that science looks for water in the cosmos, the more places they seem to find it.[353]

Scientists have known for quite a while that massive water clouds exist in outer space. As soon as telescopes were sensitive enough to detect it, the reports came in quite frequently. One of the first was from the University of California that reported in *Science*:

> Radio spectral line radiation of water molecules at a wavelength of 1.35 centimeters has been measured from eight sources in the galaxy. The sources are less then 7 arcminutes in diameter, have extremely high brightness, temperatures, and show many spectral features...Seven of the eight H_2O line emission sources which have been observed agree in position with known

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[353] West Marrin, *Universal Water: The Ancient Wisdom and Scientific Theory of Water*, Hawaii, Interocean Publishing, 2002, p. 67. Water has also been found on the surface of the sun. It survives the high temperatures of the sun's photosphere since the water is confined to the dark, cool regions of sunspots whose temperature is less than 3,500 Kelvin. Marrin adds: "The water discovered in the Sun and in various stars is understandably known as hot water, but it is unmistakably water, based on the wavelengths of infrared radiation that are absorbed…water is believed to filter out certain frequencies of EM radiation that are given off by stars….When these stars die, they appear to go out in a flood of water as This Element plays out its less glamorous role of mediating the destruction or recycling of the universe's stuff" (*ibid*., pp. 78-79).

> hydroxide emission sources within the accuracy of measurement.[354]

The article goes on to say that the sizes of the water clouds range in length to about 80 billion miles, a distance which is 27 times the distance between the sun and Pluto. A more recent newspaper report concurred with this evidence:

> Astronomers have detected water at the most distant point from Earth so far, a discovery that adds to the growing belief this essential ingredient of life may be present throughout the universe. The water was found 200 million light years away by radio telescope in Markarian 1…said James A. Braatz, an astronomer at the University of Maryland.[355]

Often water is found in the strangest places:

> Recently, two of the brightest supergiants in the galaxy, Betelgeuse (in the Orion constellation) and Antares (in the Scorpio constellation), were discovered to actually have water in their photospheres, as well as in the circumstellar material surrounding their photospheres….The structure of photospheres in cool stars is due primarily to the opacity of water, which is one of the most abundant molecules in such stars. The presence of photospheric water in these red supergiants confirms that it is located within the star itself and is not just a component of the dust and gas clouds surrounding stars. Aging supergiants have

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[354] S. H. Knowles, *et al.*, "Spectra, Variability, Size, and Polarization of H2O Microwave Emission Sources in the Galaxy," *Science*, March 7, 1969, pp. 1055, 1057. Basil writes: "Let us understand that by water, water is meant; for the dividing of the waters by the firmament let us accept the reason which has been given us" (*Hom.*, 3, 9).

[355] "Water found on distant galaxy," *Associated Press*, Minneapolis, 1994. Braatz continues to find water in space. As of 2005, Braatz's most recent abstract reveals a "Search for Extragalactic Water Maser Emission with the GBT: Independent Measurement of the Hubble Constant: Consequently, we propose to conduct a search for extragalactic water maser emission in edge-on Seyfert 2 and LINER systems. Considering the detection rates of our recent GBT surveys among edge-on active systems, we expect to detect ~20 new sources, thereby increasing the number of known water maser sources by nearly 50%" (Conducted by the National Radio Astronomy Observatory).

> been observed to release massive amounts of water as they die.[356]

Regarding the water in and surrounding the constellation Orion, Marrin adds:

> Recent data indicate that this cloud complex contains an extremely high concentration of water vapor, which has been estimated on the order of 1 part in 2,000 or about 500 parts per million. This is about twenty times greater than the water concentration in other interstellar gas clouds and represents enough water to fill the Earth's oceans ten million times![357]

In addition to water's ubiquity, modern science is continually amazed at the makeup and function of the water molecule. The simple combination of two hydrogen atoms and one oxygen atom has, as it turns out, a dizzying array of combinations and actions that is highly unique among nature's compounds. As Marrin tells it:

> Water is not simply H_2O, but rather is a complex network of interconnected water molecules, especially in its solid and liquid states. Moreover, this network is constantly shifting its connections (known as hydrogen bonds) among neighbors so that the resulting geometries are exchanged as many as a trillion times per second….Many of water's most puzzling properties, as well as its ability to solvate or "include" an amazing variety of substances within its network, are a direct result of these molecular gymnastics…[358]

And later:

> Based on the percentage of water versus carbon-containing compounds in biological organisms, there is little doubt that the biosphere is water-based rather than carbon-based. Not only does water constitute most of our mass, it is required in essentially every biological structure and process. It was formerly understood that water simply acted as the solvent or matrix within which the carbon-containing compounds (*e.g.*, DNA,

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[356] *Universal Water*, pp. 76-77.
[357] *Universal Water*, p. 78.
[358] *Universal Water*, p. 93.

> proteins) orchestrated the drama that creates and sustains biological life. It now appears as though water participates in directing the processes to an extent that was previously unimagined.[359]

The purpose of detailing the above facts is to point out that, as modern science has confirmed the presence of water in outer space, it is certainly no stretch of the imagination to accept that there is "water above the firmament," as both Genesis 1:6-9 and Psalm 148:4 indicate. Considering the complexity and versatility of the water molecule, it no doubt plays a vital role both on Earth and in the cosmos, the latter being a dimension of water's existence that science is just now beginning to discover and confirm. We will see more of the precise function of this cosmic water later in Hildegard's writing.

Scriptural Accounts of Primordial Water and Plasma

As we noted above, according to Hildegard the water above the firmament is just one of six layers surrounding the Earth. If this is, indeed, the correct understanding of the structure of the universe, we can then reconstruct the process of its development and its constitution by employing other information from Scripture. The relationship between the layers is expressed in various passages. For example, 2 Peter 3:5 confirms Genesis 1:2's stipulation that the Earth was originally created inside a spherical mass of water:

> …that by the word of God the heavens existed long ago, and an Earth formed out of water and by means of water, through which the world that then existed was deluged with water and perished. But by the same word the heavens and Earth that now exist have been stored up for fire, being kept until the day of judgment and destruction of ungodly men. (RSV).

The clause "Earth formed out of and by means of water" is the Greek γῆ ἐξ ὕδατος καὶ δι ὕδατος, wherein ἐξ means the Earth came from water, while the Greek δι, in this case, does not mean "through" but is closer to "between," and thus tells us that the Earth was surrounded by water (*i.e.*, water covered the entire spherical circumference), and held there, as Peter says, by the word of God. The original mass of water surrounding the Earth was huge, measuring multi-thousands of miles in diameter, since later it would be used to cover the vast circumference assigned to it in the distant cosmos. Hildegard tells us that the original **water surrounding the Earth was solid ice**, until the Spirit moved upon it and light was created.[360] Consequently, the Earth of the First day of creation was like a seed in the middle of a vast frozen ocean. We can assume that once the light was created its heat melted the ice. Moreover, since science shows that a great residue of water remains in the cosmos, we can surmise that as the firmament expanded on the Second day and took the greater portion of the primordial waters with it to form the "waters above the firmament," a substantial residue of that water was left in the cosmos and it is this amount that science is now detecting in outer space, and whose importance we will discover momentarily.

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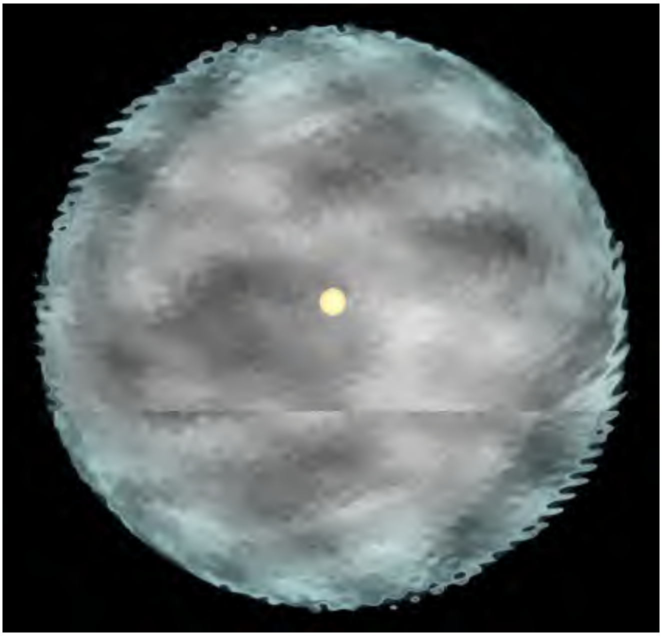
[359] *Universal Water*, p. 125.



In addition, 2Peter 3:6 indicates that the original water surrounding the Earth was later employed in the Great Flood (Genesis 7-9). This does not necessarily mean that the "waters above the firmament" were called down, for they are permanently fixed in their respective cosmic layer;

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[360] "During the Creation, the Water was then cold and didn't flow, while the Earth was still empty. But the Spirit of God moved up the waters and heated them, so that they should contain the Fire and flow as liquid" (*Ursachen u. Behandlung der Krankheiten*, 68; *Das wahre Weltbild*, p. 89). In Gn 1:2, 6, 7, the Hebrew dual form for water, המים, implies two water forms or sources.

rather, the water left behind in the cosmos after the expansion of the firmament could have been accumulated and dispersed on the Earth at the proper time, and its source is thus appropriately called the “windows of the heavens” (Genesis 7:11; 8:2). Since, as noted above, astronomers have discovered huge water clouds in space that stretch in length by as much as 27 times the distance from the sun to Pluto and could thus fill our oceans a billion times over, it is certainly reasonable to surmise that such massive deposits of water in space could have been used in the Great Flood. The water presently found in our local system may be the remnants of that event.

Interestingly enough, St. Peter says in the same context:

> But by the same word the heavens and Earth that now exist have been stored up for fire, being kept until the day of judgment...the heavens will pass away with a loud noise, and the elements will be dissolved with fire, and the Earth and the works that are upon it will be burned up” (2Pt 3:7,10).

The source of this destructive energy may be Hildegard’s two outer layers of “fire.” We can surmise that at the appropriate time they will be brought down from their remote recesses in space and squeezed toward the center of the universe until the world is destroyed. As opposed to the *Big Bang*, we might call this scenario *The Big Implosion*. In the beginning of creation, however, what most likely occurred is that these two layers of energy originated from the “light” created on the First day. This primordial light (which was distinct from the sun and stars that would not be created until the Fourth day), initiated the day/night sequence on Earth for the first three days of the creation week. The daylight was produced by a confinement of the light to less than a hemisphere (Genesis 1:3 says “and God separated the light from the darkness”), which light moved around the Earth every twenty-four hours, perhaps in tandem with the Spirit that “moved over the face of the waters,” to keep it liquefied.

One way in which the luminosity would be possible is if the light of the First day were in the form of a fire or plasma, since in that form it can be contained and moved.[361] For the purposes of comparison, the sun

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[361] We note here that Aristotle held a view of light close to the modern view, that is, that light is ἐνέργεια (energy) and travels through or vibrates in a δίαφανες (diaphanes) or medium filling all of space. This is close to the Pythagorean view that understood light as a stream of particles that hit the eye, and opposed to the view of Plato that the eye emits a “divine fire” that is directed to the object. The Arabs of the Middle Ages adopted Pythagorus’ view. It wasn’t until 1690 that a wave theory of light was proposed by Huygens, and Newton understood it as

(which modern science has confirmed is a giant ball of fire), is also called a "light" in Gn 1:14-17, and it is also assigned the same function, that is, "to separate the light from the darkness" (Gn 1:18). Presently, as the sun revolves around the Earth, it creates the day/night sequence. In the same way, the rotational movement given to the primordial light of the First day was the means by which God "separated the light from the darkness" on the first three days. Hildegard speaks in a similar way:

> Almighty God, who is life without beginning and without end, and who constantly knows everything, made the material for all heavenly things and all mundane things together, that is, heaven as lucent matter, and earth, which was opaque matter. This luminous matter, however, from the glory of eternity flashed like a dense light that lit up over the opaque matter in such a way as to join itself to it. And the two substances were created at the same time *and appeared as if in a circular orbit*….The six days are six acts; for the beginning and the completion of each act is called a day. Neither was there an interval after the creation of primary matter, but instantly, as it were, the Spirit of God hovered over the waters, and afterwards, too, there was no delay, but God said immediately: "Let there be light" and light was made.[362]

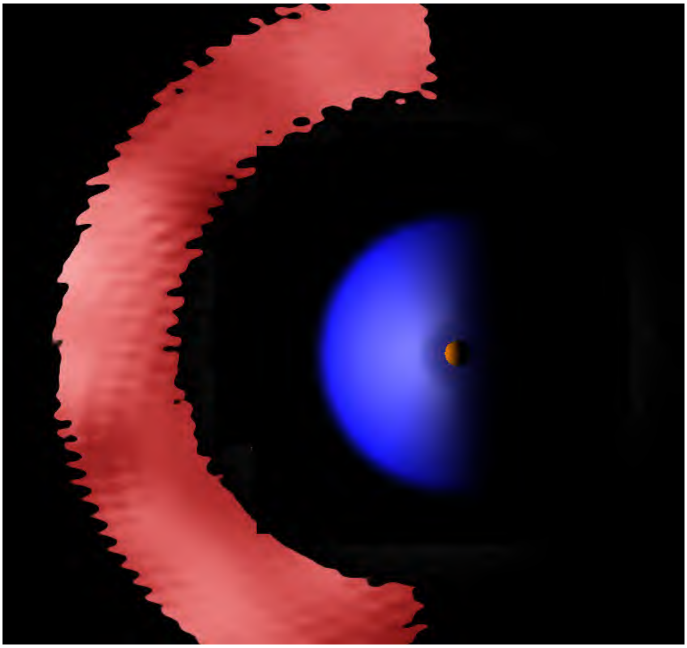
Scripture later maintains this distinction as it speaks of four separate celestial sources. For example, in Ec 12:2 the preacher writes: "Before the sun, and the light, and the moon, and the stars be darkened."[363] Notice that the sun and stars are distinguished from the "light." The same four sources are noted again in Psalm 148:3: "Praise ye him, O sun and moon: praise him, all ye stars and light." Thus we know that this detailed description is not merely an idiosyncrasy of only one biblical writer.

"vibrations in the ether," thus developing the view of Aristotle. Today the theory of what constitutes light is still not settled. It is best described as waves that carry particles or waves composed of particles, since light has properties both of a wave and of particles. As Oliver Lodge once quipped: "the two concepts are like a shark and a tiger, each supreme in its own element and helpless in that of the other."

[362] Briefwechsel, *Das Wahre Weltbild*, p. 22. Regarding the creation of the angels, Hildegard states that it occurred during the creation of light. She writes: "For at the first fiat, 'let there be,' the angels came forth…" (*ibid.*).

[363] The Hebrew contains four separate nouns with an article for each of the four, in addition to each being separated by the *waw* conjunction, denoting in the clearest of terms that the four sources are separate and distinct. Reading from right to left:עד אשר לא־תחשך השׁמשׁ והאור והיּרח והכּוכבים

Since at the beginning of creation the Earth was surrounded by a huge mass of water, the light created subsequent to the initial 12 hours of evening on the First day would have radiated through the water on its way to the Earth's surface.[364] Water, then, was the first medium in which light traveled. Being on the outer circumference of this multi-million-mile layer of water, these primordial fires would, indeed, have been immense, much larger than our present sun, and even much larger than thousands of suns. But since the massive water beneath it would have proportionately diffused its light and heat, the Earth would have received the proper amount of radiation. As Hildegard says, the four elements of fire, earth, water, and air are kept in perfect balance, during and after the creation.



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[364] If we assume that the primordial light was created immediately after the Earth and the water surrounding the Earth were created, yet "darkness" or "evening" would have transpired for 12 full hours before the light appeared on the surface of the Earth, this would allow 12 hours for the light to travel through the water to reach Earth. In other words, while the light is traveling through the water, the surface of the Earth is still in its 12 hours of "darkness" or "evening." Considering that light travels two-thirds of its normal air speed in water, it would have traveled 123,000 miles per second through the primordial water. Traveling 12 hours at 123,000 mps means that the radius of the surrounding water could have been as long as 10,627,200,000 miles, which equals 1.54×10^{28} cubic miles of volume. This is more than three times the spherical volume of our solar system.

The Sequence from the First Day to the Fourth Day

One might ask why there were two separate light sources: one source for Days 1-3 and another source for Days 4-6. The reason is that the major portion of both the primordial light and the primordial water created on the First day are to be transported away from the Earth, a migration which happened on the Second day, when God created the firmament. After the water is sent away, it is the firmament's turn to serve as light's medium. As the firmament was being "stretched out"[365] it created the fabric of space (which, as we stipulated earlier, is a rigid yet flexible particulate, not a vacuum), and at the same time, took with it the fire and water to their new recesses in the outer universe, and which subsequently formed the layers of fire and water existing there in Hildegard's cosmology. Our present sun would have been too small to provide the light for the day/night sequence required by the text of Genesis 1:5: "and there was evening and there was morning, one day." As we noted, the size of the sphere of water that covered the Earth on the First day was thousands of times bigger than the sun itself and therefore the sun's light could never have penetrated to the Earth in order to provide enough light to dispel the darkness.

Although the expanding firmament carried the greater portion of the light and water to outer layers of the universe, a small portion of the water remained on Earth and a portion of the fire was left above the Earth. This residual water was then used to fill the ocean and river basins on the Third day, while the residual light was confined to a hemispherical region above the Earth and rotated with the same twenty-four cycle as did the larger hemisphere of fire on the First day. On the Second and Third days, of course, much less light would be needed to illuminate the Earth since after the First day there is no longer any water surrounding the Earth to diffuse the light. As these residual fires surrounding the Earth burned out just after the second 12-hour period on the Third day, this would necessitate the creation of additional "fires" on the dawn of the Fourth day, namely the sun, in order to provide the Earth with an uninterrupted sequence of day and night. (NB: Genesis 1 keeps track of time by "evening to morning," not morning to evening).

It is more likely, however, that the residual fire (or energy plasma) circling the Earth on the Second and Third days was not exhausted (the same is true for the sun for the foreseeable future) and was thus used to form the sun on the Fourth day, a position held by a number of Church

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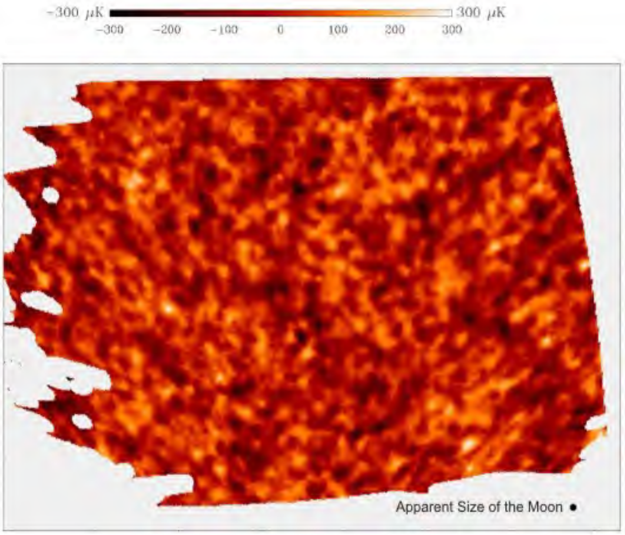
[365] *Cf.* Jb 9:8; Ps 104:2; Is 42:5; 44:24; 45:12; 51:13; Jr 51:15; Zc 12:1. We also note that, although Scripture says many times that the sun, stars and moon are "in the heavens," the Earth is never said to be "in the heavens."

Fathers and medieval scholars.[366] This sequence of events fits the text of Genesis 1, since the size and intensity of the residual fires on the Second and Third days would have to be the same as our present sun, otherwise the Earth would not have been hospitable to the vegetation created on the Third day. The firmament, having already been created for the purpose of being a depository for the heavenly bodies, will have the sun placed in it on the Fourth day. As the firmament rotates on a twenty-four hour cycle, it will carry the sun with it, and thus the day/night sequence will be uninterrupted for the remainder of time.

The Outer Layer of Energy Confirmed by Modern Science



The original mass of fire, however, is still at the outer recesses of the universe. Its heat is very intense, and thus we can understand why it will someday be used to destroy the inner universe. Interestingly enough, modern science may have received a glimpse of this layer, or something close to it. In December 1998 a team of international cosmologists sent up the BOOMERANG (Balloon Observation of Millimetric Extragalactic Radiation and Geophysics) telescope over Antarctica for ten days.[367] It took pictures of the cosmic microwave background radiation as it would appear at the edge of the universe. The picture shows what looks like a **mass of fire or plasma**, evenly dispersed throughout the universe. As one caption described it: "In this picture, we see the distant universe as it makes its transition from a glowing 2700ºC plasma to a perfectly transparent gas….BOOMERANG is the first telescope with the resolution and sensitivity required to image these…" Not surprisingly, most scientists who interpreted the picture believe in the Big Bang theory, thus they add that the plasma is from "approximately 14 billion years ago, a mere 300,000 years after the Big Bang." Of course, since the Big Bang never occurred, this leaves the primordial plasma as a created artifact of the First day of Creation, when God said: "Let there be light."

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[366] Gregory of Nyssa (*Hexameron*, PG 44, 66-118); Ephrem the Syrian (*Genesim et in Exodum commentarii*, in CSCO, v. 152, p. 9); Chrysostom (*Homilies on Genesis* (PG 53, 57-58). Thomas Aquains also held this view (*Summa Theologica*, 1, Qs. 67, Art. 4, Re. 2), as did a few other medievals: Honorius of Autun (*Hexameron* PL 172, 257); Peter Lombard (*Lombardi opera omnia*, PL 192, 651); Colonna, aka Aegidius Romanus (*Opus Hexaemeron*); Nicholas of Lyra (*Postillae perpetuae*); Cajetan (*Commentarii de Genesis 1*), and followed by Moses Mendelssohn (*Commentary on Genesis*) Zwingli (*Werke*); Luther (*Commentary on Genesis*); Calvin (*Commentary on Genesis*); Petavius (*Dogmata theologica*) *et al*.

This conclusion is supported by the fact that the BOOMERANG's depiction of the primordial plasma does not support the Big Bang theory. Although the world's scientists were initially enthused by the pictures, that enthusiasm soon turned to dismay when it was discovered that the plasma contained too many unexpected anomalies. As *Scientific American* reported it:

> Usually cosmology goes something like this: new observations come in, scientists are baffled, models are upended. After the dust settles, however, patches are affixed and the prevailing theory emerges largely intact. But when the measurements by the Boomerang and Maxima telescopes came in, the sequence was reversed. Scientists were elated. "The Boomerang results fit the new cosmology like a glove," Michael S. Turner…told a press conference in April. And then the dust settled, revealing that two pillars of Big Bang theory were squarely in conflict…[368]
>
> …follow up studies soon showed that the lingering discrepancy, taken at face value, indicates that the universe is in fact spherical….The second …suggests that the primordial plasma contained surprisingly many sub-atomic particles….But accounting for those extra particles is no easy matter. According

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[367] *Nature*, April 27, 2000, pp. 907-1021.

[368] "Boomerang Effect," *Scientific American*, July 2000, p. 14.

> to Max Tegmark…the Boomerang results imply that subatomic particles account for 50 percent more mass than standard Big Bang theory predicts – a difference 23 times larger than the error bars of the theory. "There are no known ways to reconcile these measurements and predictions," says David R. Tytler of the University of California at San Diego.[369]

A similar finding was found by the Goddard Space Flight Center headed by Alexander Kashlinsky. Discovering the same "strange background glow" from having "peered all the way to the most remote objects in the universe," *Discover* writes:

> Kashlinsky and his team at Goddard examined a deep-exposure image of a patch of sky taken by NASA's orbiting Spitzer Space Telescope and then subtracted the light from all the evident stars and galaxies. What was left was a dim background glow never seen before…." We see a signal that cannot be explained by stellar populations that we know," Kashlinsky says.[370]

So here we see that the scientific evidence does not support the Big Bang theory; rather it supports Hildegard's spherical universe with the hot plasma she says resides at its outer layers. According to Hildegard, the ether and water layers beneath it cool the high temperatures created by the plasma. The ether layer would serve as the initial thermal cushion to diffuse the heat, while the water layer would complete the process. As Hildegard puts it: "The outer sphere throws its fire equally on the other spheres. On the opposite side, the water sphere humidifies equally with its humidity all the other spheres," yet she also tells us that these cosmic waters "are in their own state, different than the lower waters [on Earth]."[371] As we will see later, the cosmic water may be in a super-gaseous state, yet it humidifies the whole universe, and, as Hildegard adds: "The humidity and fire produce the appropriate heat to strengthen the firmament."[372] This exchange of the four elements, among other processes (such as the cosmic winds upon which we will elaborate later), would leave the ambient temperature of the universe as cool as the present 2.73° Kelvin, while the water nearest the fires could be as hot as 3500° Kelvin and still allow the water to survive in the form of molecules.

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[369] *Ibid.*, p. 15.

[370] Susan Kruglinski, "Hunting of the First Stars," *Discover*, February 2006, p. 17. George F. R. Ellis recognized this same trait in inhomogeneous [Earth-centered] models of the universe, stating: "Just as in the standard universe models, the region beyond would be occupied by a hot cosmic plasma; and this could be the source of the blackbody radiation" (G. F. R. Ellis, R. Maartens and S. D. Nel, "The Expansion of the Universe," *Mon. Not. Royal Astronomical Society*, 184, 1978, p. 444).

[371] *Die göttlichen Werke*, 56; *Das wahre Weltbild,* p. 84. Posch adds: "The volume of these elementary quantas of fine matter is smaller by many orders of magnitude than the atomic corpuscles, and which are invisible to our eyes. The upper waters

The Purpose of the 2.73° CMB

The maintenance of 2.73° Kelvin[373] brings up a very significant dimension of Hildegard's cosmology. Modern science has struggled to understand the origin and homogeneity of the 2.73° temperature, the most popular theory being that it is the remnant of the radiation from the so-called Big Bang explosion that various scientists believe occurred 13.5-15.5 billion years ago. Others hold that it is the resulting energy from the vibration of dense particles in space; while still others believe it is the residual temperature of all the stars and galaxies in the universe.

According to Hildegard's visions, the 2.73° Kelvin is a well-designed and precise residual temperature that is employed to keep the universe stable. It is the result of a cyclical thermic process occurring in the whole universe precisely so that it won't overheat. The very high density of the firmament (which we will detail momentarily) allows it to act as an ideal gas, and according to the well known formula: $P \times V/T = R$,[374] the 2.73°

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are also invisible, as is the cosmic air and fire. The upper water is not comparable to H_20, as the cosmic air is not comparable to our atmospheric air" (*ibid*).

[372] *Die göttlichen Werke*, 56; *Das wahre Weltbild*, p. 84.

[373] The Kelvin scale begins with absolute zero, below which temperatures do not exist. Absolute zero, or 0°K, corresponds to a temperature of -273.15° Celsius. Thus, a temperature of 2.73° Kelvin is very cold and very near absolute zero. The Kelvin degree is the same size as the Celsius degree. For example, the freezing point of water is 0° Celsius; the boiling point of water is 100° Celsius, which correspond to 273.15° Kelvin and 373.15° Kelvin, respectively. The Kelvin scale is named after the British mathematician and physicist William Thomson Kelvin, who invented it in 1848.

[374] The behavior of an ideal gas is described by the relationship $PV = kT$ (pressure × volume = k × temperature). The proportionality constant, k, is usually expressed as the product of the number of moles, n, of the gas and a constant R, known as the universal gas constant, which has a value of 8.3149×10^3 joules/kilogram-mole-degree. The ideal gas law is simplified by replacing the ordinary volume V by the specific volume v, which is equal to V/n, which then yields the formula $Pv = RT$.

Kelvin is the precise temperature needed to coordinate with the volume and pressure within a finite and closed universe. If these values were not maintained, then, as Hildegard says, the universe would “melt.” We have already seen in our discussion of helium-4 in Volume I that at the right Kelvin temperature (between 0.25° and 3.0° for helium-4) what we know as a gas at room temperature becomes a frictionless “supersolid” at the low end of the Kelvin scale. As we will see, Hildegard tells us the same principle is true with the firmament.

The Four Elements of the Universe

Hildegard’s visions show that she understood matter to be composed of four basic elements, the same ones that Aristotle recognized: fire, air, water and earth, which Aristotle obtained from Empedocles. Tempted as we might be to dismiss these as primitive concepts or think of them as referring merely to specific physical substances (*e.g.*, dirt, flames, oceans/rivers, wind/breath), in reality the four terms represent the general makup of all matter. On one level of understanding, “earth” refers to solids; “water” refers to liquids; and “air” refers to gases – the three states of matter that any modern scientist would recognize. The “fire” represents energy, or what some identify as the fourth state of matter – plasma. In fact, plasma physicists consider fire to be plasma, as they do the sun, the stars, intergalactic nebulae, quasars, radiogalaxies, galaxies, auroras, lightning, the flow of electrical current in conductors and semiconductors, fluorescent lights and neon signs. Thus we have matter and energy, the two entities constituting anything physical that the universe has to offer. Even modern scientists recognize the fire-air-water-earth terminology. For example, biogeochemist Egon Degens writes:

> The element air is described by molecular kinetics and statistical physics. The “simple” substance fire is thermodynamically defined as heat or energy. Quantum mechanics, solid-state physics and chemistry refer to matter rather than to Earth. The problem child, however, is water, because so far no equation can thermodynamically describe its reaction and properties at the molecular level.[375]

As we relate Hildegard’s description of these four elements to even deeper facts from modern science, we find that the four also correspond to the fundamental building blocks of nature that we moderns have assigned such names as protons, neutrons and electrons. The “fire” is the energy of the atom, otherwise known as the electron, whereas the protons and neutrons, known as a nucleon, are the “earth” (proton) and “water” (neutron). As we will see later, the atom is also comprised of “air,” which occupies the space between the “fire” of the electron and the “earth” and “water” of the nucleon. In a very similar way, Hildegard’s visions show the universe is constructed with the energy zones in the outer layers; the air/water layers in the middle zones; and the earth material in the center.

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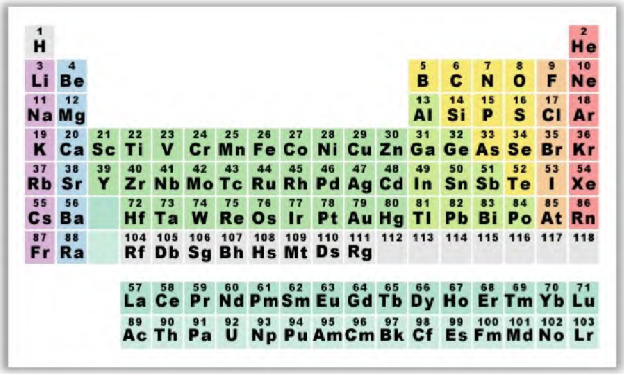
[375] *Universal Water: The Ancient Wisdom and Scientific Theory of Water*, Hawaii, Interocean Pub., 2002, p. 93.



1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112	113	114	115	116	117	118
			57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
			89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Accordingly, Hildegard adds: “More or less than these four elements there is nothing.”[376] Scientifically speaking, we understand this to mean that the 103+ elements of the **Periodic Chart** do not represent substances that have differing fundamental components. Lead, for example, is not made of lead protons and lead electrons; rather, lead has 82 protons and 82 electrons. If we take away two protons and two electrons to leave an 80-80 balance, we will have the element mercury. Take away one more proton and electron and we now have gold. The fundamental building blocks are the same; only their number and ratio change from element to element.

The cosmic spheres of fire, air, water and earth are in constant communication and exchange in order to produce the proper balance required for the universe’s stability. This, we might say, is the *Ultimate Unified Field Theory*. As Hildegard puts it:

> God has built the world by means of the four elements, so that no one of them may be separated from the others, for then the world

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[376] *Ursachen u. Behandlung der Krankheiten*, 71, *Das wahre Weltbild*, p. 85.

> would go back to nothingness if an element could exist separately from the others.[377]

For example, to varying degrees, fire (energy) permeates the other three elements: water, air and earth. The very formula we moderns use, $E = mc^2$, is, in Hildegardian terms, little more than the permeation of the element fire (energy) into earth (matter). As we noted above, on a macro scale astronomers have seen evidence of "fire" in the form of plasma all throughout the universe, the study of which is commonly known as plasma cosmology.[378] In addition, it is fire (energy) that turns solids into liquids, and liquids into gases. Each state must maintain a certain energy envelope in order to remain a solid, liquid or gas. As Hildegard puts it in her scientific terms: "The water contains in itself fire…the water could not flow if it didn't contain some fire."[379]

In Hildegard's terminology, "fire" represents many things, and we moderns have to accommodate her language to what we know scientifically. Although we speak of energy coming in the form of the entire electromagnetic spectrum – from gamma rays, to visible light, to microwaves – in Hildegard's vision "fire" represents all of these various energy forms. As Dr. Posch has suggested, we would venture to say that

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[377] *Ursachen u. Behandlung der Krankheiten*, 68, *Das wahre Weltbild*, p. 89.

[378] Nobel laureate, Hannes O. G. Alfvén, "Cosmology in the Plasma Universe: An Introductory Exposition," IEEE Trans. *Plasma Science*, Feb, 1990; "Plasma Physics from Laboratory to Cosmos – The Life and Achievements of Hannes Alfvén," by Carl-Gunne Fälthammar, IEEE Trans. *Plasma Science*, June 1997; *World-Antiworlds: Antimatter in Cosmology*, 1966; Eric Lerner, *The Big Bang Never Happened*, 1992; US Dept. of Energy advisor and Associate Director of Los Alamos National Laboratory, Anthony Peratt (A. Peratt and D. Nielsen, "Evolution of Colliding Plasmas," *Physical Review Letters*, 44, pp. 1767-1770, 1980); Oscar Buneman in "A Tribute to Oscar Buneman – Pioneer of Plasma Simulation," IEEE Trans. *Plasma Science*, Feb, 1994; Nobel nominee, Kristian Birkeland, in "The Worlds in the Universe," wrote: "This theory differs from all earlier theories in that it assumes the existence of a universal directing force of electro-magnetic origin in addition to the force of gravitation, in order to explain the formation around the sun of planets (which have almost circular orbits and are almost in the same plane) of moons and rings about the planets and of spiral and annular nebulae" (*Sky and Telescope*, "Birkeland and the Electromagnetic Cosmology," May 1985). The first to recognize the plasma state was Sir William Crookes, who discovered it in 1879, and which was later given the name "plasma" by Nobel laureate Irving Langmuir in 1929. Interestingly enough, Hildegard's visions portray something very close to plasma cosmology for the origin of the sun's energy and its relationship to the planets.

[379] *Ursachen u. Behandlung der Krankheiten*, 68, *Das wahre Weltbild*, p. 89.

Hildegard's "fire" comes in three states, just as matter comes in solid, liquid and gaseous form. The fire we see as flames is analogous to the solid state; electrical current or light waves are analogous to the liquid state, while radiation and high-energy plasma are the gaseous state. Similar to solids, flames are confined to a certain locale. But as liquids flow, so light energy flows from one place to another. For example, a lightning bolt that descends and hits the ground will suddenly burst into flames, and in such cases one could say that the liquid form of energy was turned into a solid form. We also know that light can penetrate its medium only so far, for opaque substances will deter it, whereas radiation, like a fine gas, can penetrate through various surroundings. Radiation also produces heat, and thus makes it similar to a flame. In fact, there is so much "fire" in the element radium that it literally overflows with radiation. In the words of Marie Curie, the discoverer of radium:

> A glass vessel containing radium spontaneously charges itself with electricity…Radium possesses the remarkable property of liberating heat spontaneously and continuously. A solid salt of radium develops a quantity of heat such that for each gram of radium contained in the salt there is an emission of one hundred calories per hour. Expressed differently, radium can melt in an hour its weight in ice. When we reflect that radium acts in this manner continuously, we are amazed at the amount of heat produced, for it can be explained by no known chemical reaction. The radium remains apparently unchanged.…As a result of its emission of heat, radium always possesses a higher temperature than its surroundings.…When a solution of a radium salt is placed in a closed vessel, the radioactivity in part leaves the solution and distributes itself through the vessel, the walls of which become radioactive and luminous… We may assume, with Mr. Rutherford, that radium emits a radioactive gas and that this spreads through the surrounding air and over the surface of neighboring objects. This gas has received the name emanation. It differs from ordinary gas in the fact that it gradually disappears.[380]

Another important relationship among the four elements is the affinity, on the one hand, of fire and earth, and, on the other hand, air and water. As we noted earlier, one example of the former relationship is that as "fire" represents the electron, the "earth" represents the proton. These two substances each carry a charge and thus relate to each other electrically or electromagnetically. All communication flows from positive to negative and back again. In another way, light is invisible unless it reacts with matter. We cannot see a light beam until some solid object impedes it, and this is one reason why the night sky is so dark. It is different for air and water. The communication between their domains consists largely of mechanical waves, incorporating pressure and temperature and other motions.

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[380] "Radium and Radioactivity," Mme. Sklodowska Curie, *Century Magazine*, January 1904, pp. 461-466. The "gas" is now known as radon.

Upon these four elements and their communicative principles is based the workings of the whole universe. It is really quite simple. Modern science assigns various values and proportions to these entities and their relationships, such as Planck's constant, Boltzmann's constant, Avogadro's constant, the Gravitational constant, the electron charge value, etc., but they are all essentially describing the four basic elements of Aristotelian science and how they interact with one another.

The Rotation of the Firmament

As we have indicated the point earlier in this volume, the form and substance of the biblical "firmament" is particulate. Although its discovery has eluded both biblical scholars and scientists, some, like St. Augustine, never doubted its existence. As he once said in his famous book *The Literal Meaning of Genesis*: "…we must not doubt that it does exist in that place. The authority of Scripture in this matter is greater than all human ingenuity."[381] This is the consistent testimony of the patristic era, and it is a haunting voice against modern scholars who have given up the hope of finding the firmament, thus forcing them to declare that "Augustine's search for the firmament should seem baffling."[382] Unlike many modern scholars who have accepted Copernican cosmology with its attendant Big Bang origins, the Fathers were faithful to the biblical text, no matter how difficult it was to understand from their limited science. The medievals who followed them adhered with the same tenacity to the literal words of Scripture. As such, the Creator did not leave us in the dark regarding the correct understanding of Holy Writ.

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[381] *The Literal Meaning of Genesis*, Book 2, Chapter 5, Number 9. Aquinas adds: "Whether, then, we understand by the firmament the starry heaven, or the cloudy region of the air, it is true to say that it divides the waters from the waters..." *Summa Theologica*, Book 1, Question 68, Art. 3.

[382] Stanley Jaki, *Bible and Science*, p. 95.

As we noted earlier, geometrically speaking, there is no relative difference between a rotating universe around a fixed Earth and a rotating Earth in a fixed universe. They are, indeed, mirror images of one another. Nevertheless, there is only one true reality. As such, only one cosmology can be correct. In Hildegard's visions, it is the firmament that rotates, not the Earth, and this fundamental fact is mentioned many times in her description of the universe. As Helmut Posch notes it:

> This true world-view is no invention of mine. It is the result of Hildegard's statements. So that every reader may see this for himself, in what follows let me quote those statements which are of decisive import for the world view….All this detailed physical knowledge far exceeds our present-day knowledge. Only someone who knows how the universe is really designed can speak like this. Since Hildegard was not a genius but a simple woman, all this knowledge can only arise from instructions of the Omniscient One."[383]

Accordingly, Hildegard writes:

> And further I saw the world vault, through powerful drifts of the east and the south winds with their crosswinds, allowing it to circulate over the Earth from east to west, and there the west wind and the north wind caught it together with its crosswinds and tossed it underneath the Earth back from west to east.[384]

Posch gives us the meaning of her words:

> According to this, the entire universe is put in motion by the cosmic winds. They supply the unimaginable propulsion energies for the rotation of the firmament. Observed from the north, the firmament rotates equatorially and clockwise from east to west. Not a single heavenly body moves by its own power. All of the kinetic propulsion energy flows entirely from the stationary-positioned winds. Without these winds the entire universe would be completely without gravity, weightless like thoughts…. Even the largest stars would not weigh a gram because mass without the wind energy flowing through it would contain no gravity-forming power ….Mass and energy only

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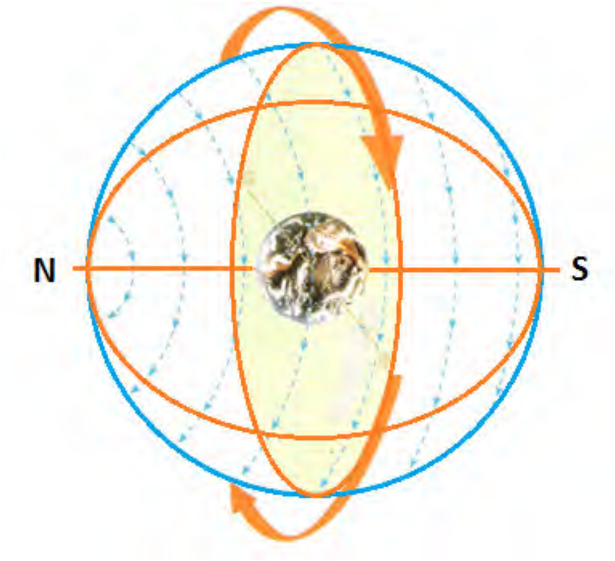
[383] *Das wahre Weltbild*, pp. 119, 121.

[384] *Das wahre Weltbild*, p. 113.

> appear to be equivalent. At close observation, energy is an interaction between matter and the winds.[385]



Thus, the entire universe rotates 360° per day, moving clockwise, or east to west, from the position of one standing at the North Pole. To reinforce the picture Posch adds: "Therefore, geostationary satellites travel against the rotation of space in order to appear stationary [to us]." We also see that the phenomenon of inertia in the cosmos is not due to some mysterious property of matter (that modern science has yet to explain), but is merely the result of cosmic winds pushing the firmament and its heavenly bodies in the designated direction. In this system, as Posch notes: "Thus it has been clarified physically why the sun, with its enormous mass, can move around the little spot of Earth. According to the current law of gravity, there would be no explanation for this."[386] Hildegard's vision thus adds a deeper understanding to the mundane meaning often assigned to the winds of Ecclesiastes 1:4-6:

> A generation goes, and a generation comes, but the Earth remains forever. The sun rises and the sun goes down, and

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[385] *Das wahre Weltbild*, pp. 113-114.

[386] *Das wahre Weltbild*, p. 120. Note: Posch is referring strictly to the Newtonian explanation for gravity, an explanation that does not take into account the Machian view that the whole universe is involved in the forces experienced by our solar system.

> hastens to the place where it rises. The wind blows to the south, and goes round to the north; round and round goes the wind, and on its circuits the wind returns.

Moreover, because "the Earth remains forever," Hildegard's visions see a real "up" and "down" to the universe, which is due to the immobility and permanence of the Earth from which all other movements in the universe are measured. She writes:

> For the sun, God has determined that it should shine above the Earth and hide under the Earth. That's why during the day it shines on the Earth, just as a man lives watchfully with open eyes during the day; at night, however, it moves beneath the Earth, just as a man sleeps with his eyes closed at night.[387]

The Local Cosmic Counter-Current

In addition to the rotation of the firmament by the force of the cosmic winds, Hildegard sees a local counter-current in her vision. She writes:

> Also I saw: in the upper fire of splendor there appeared a circle that girded the entire firmament from east to west. From there a wind forced the planets to go from west to east against the rotating direction of the firmament. However, it did not send out its blows toward the Earth, like the other winds, but only moderated the course of the planets, as we said before already….The firmament rotates speedily, and the sun, together with the other planets, slowly moves towards it in the opposite direction and hampers its velocity.
>
> For if the sun did not impede the firmament by its resistance to it, or if it ran counter to the firmament even with the other planets and with the same velocity with which is revolves, everything would be mixed up and the entire firmament would burst asunder. For if the firmament were immovable so that it would not revolve, then the sun would be above the Earth almost throughout the entire summer, without it becoming night, and almost during the entire winter under the Earth, without it being day.

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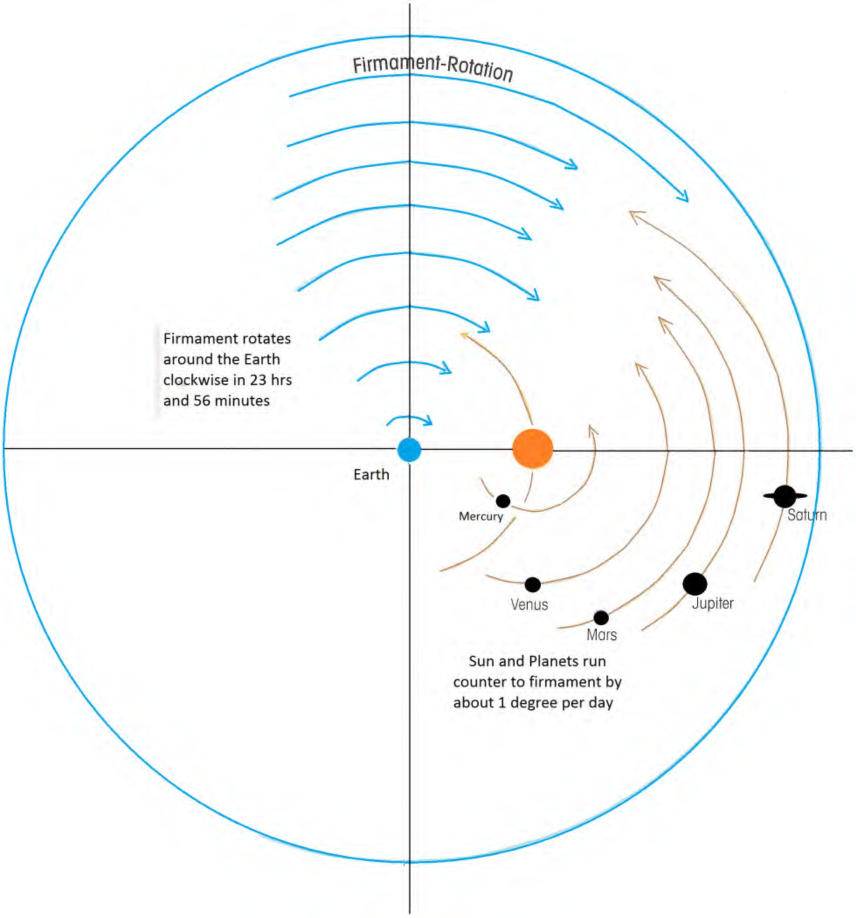
[387] *Welt und Mensch*, p. 164; *Das wahre Weltbild*, p. 120.

> Now, however, the firmament revolves in such a manner that it moves counter to the sun, and the sun counter to it, for which reason the firmament compresses itself through the heat of the sun and is made more resistant all the more quickly, that is to say: when the sun traverses the firmament and wholly penetrates it and pours through it with its fire.[388]


Firmament-Rotation
Firmament rotates around the Earth clockwise in 23 hrs and 56 minutes
Earth
Mercury
Saturn
Venus
Jupiter
Mars
Sun and Planets run counter to firmament by about 1 degree per day

So we have a counter-clockwise current that is moving the entire solar progeny from west to east against the clockwise movement of the firmament from east to west. As Posch sees it: "This relative movement is the actual centerpiece of Hildegard's celestial mechanics." The sun, which carries the planets, is moving ever so slowly against the rotating firmament due to the presence of a local cosmic wind. We can readily see the physical results of these motions and counter-motions. For example, the local motion of the sun against the firmament causes the sun to retard in its movement with respect to the Earth and the stars by about 1° of arc per day. This will cause a difference in the amount of time the stars, which are stationary inside the firmament, revolve with the firmament around the Earth, as opposed to the time the sun and the planets revolve around the Earth. The difference between the two is commonly known as the "sidereal day" as opposed to the "solar day." The sidereal day is 23 hours and 56 minutes. The solar day is 24 hours. Thus, the sun needs 4 minutes more to complete its revolution around the Earth, which is due to the fact that it is being slightly retarded by the cosmic winds in the firmament.[389] The 4 minute lag will make the sun appear to travel through the 12 stations of the Zodiac each year.

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[388] *Das wahre Weltbild*, p. 116; *Ursachen u. Behandlung der Krankheiten*, 24 in *Das wahre Weltbild*, pp. 120-121.

Hildegard gives the details of the how and why:

> For if the sun did not impede the firmament by its resistance to it, or if it ran counter to the firmament even with the other planets and with the same velocity with which it revolves, everything would be mixed up and the entire firmament would burst asunder. For if the firmament were immovable so that it would not revolve, then the sun would be above the earth almost throughout the entire summer, without it becoming night, and almost during the entire winter under the earth, without it being day. Now, however, the firmament revolves in such manner that it moves counter to the sun, and it the sun counter to the firmament, for which reason the firmament condenses itself through the heat of the sun and is made more robust all the more quickly, that is to say: when the sun traverses the firmament and wholly penetrates it and pours through it with its fire.
>
> Before the fall of Adam the firmament was immovable and did not rotate. After his fall, however, it started to move and to revolve. From the Last Day on, however, it will again stand still,

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[389] In the heliocentric explanation, the extra four minutes is said to be due to the Earth revolving around the sun, wherein the Earth must rotate 361° per day rather than 360° in order for the sun and stars to line up with the same point on the Earth each day. We might add that Hildegard's cosmic wind may find its evidence in the modern science's claim that the solar system is moving in the direction of various constellations (*e.g.*, Draco, Hercules, et al). By Mach's principle, it may just as well be that the solar system is fixed and the ether wind is moving against it.

> as it was on the first day of creation before Adam's fall. Now, however, it rotates so that it will receive its strength from the sun, the moon, and the stars, because if it stood still it would become liquified and weaken, melting in a short time. For the same reason, because it revolves according to a specific rule, it also purifies the elements. The purification at times manifests itself in the form of water-bearing black clouds, as we see them. This is like water that, being put on the stove in a pot, boils and is purified under the influence of the boiling heat.[390]

The Force that Moves the Planets

There is something even more significant about the solar wind. It is strongest nearest the sun and weakest at the planet Pluto. It can be thought of as a cyclone-like whirlwind or solar eddy within the larger circular current that pushes the firmament. As in a natural eddy, the angular velocity is fastest near the center. Hence, those planets nearest to the sun will revolve faster than those farther away. Not having any suitable mechanical reason for the various speeds of revolving planets, modern science is limited to explaining this phenomenon mathematically by the formula $F = ma$, or $a = v^2/r$, wherein a planet that is revolving around the sun is said to be accelerating, while the force of its movement is the rate of acceleration multiplied by the mass of the planet. At the same time, the planet is said to be pulled into the sun and the strength of the attraction is represented by the formula $F = Gm_1m_2/r^2$, wherein the mass of the sun and planet are multiplied with a gravitational constant G (determined in the laboratory by measuring the force of attraction between two small objects), divided by the distance squared between the sun and the planet. This is commonly known as the Inverse Square Law. The balance between $F = ma$ and $F = Gm_1m_2/r^2$ is said to keep the planet on its circular path so that it neither falls into the sun nor flies off into outer space. The problem with these formulas, however, is that they do not explain what, precisely, is the physical nature of the attracting force between the sun and the planet, nor do they explain why a planet has continual acceleration. It is similar to watching the dial on a scale calibrate the weight of an object without being able to see the object that is placed on the scale. The object could be an animal, mineral or vegetable, but we could never know by merely observing the scale's dial. Analogously, modern science has no physical explanation for gravity or inertia. They merely 'watch the dial,' as it were, and compute the result with mathematical formulas.

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[390] *Ursachen u. Behandlung der Krankheiten*, p. 24, *Das wahre Weltbild*, p. 121.

One scientist, Josef Tsau, has broken away from the constraints of Newtonian physics and believes that the universe is bathed in a primary ether particle, the neutrino, which seems to answer to Hildegard's solar wind. Tsau has a lot on his side, since the existence of neutrinos has been verified many times. Although they have mass, neutrinos are extremely small entities. They can apparently travel through the empty space of the atom and do so at the speed of light. Having no charge, they can only affect other masses by their high kinetic energy. Fifty trillion of them are said to pass through our human body every second. Seventy billion neutrinos hit each square centimeter on the surface of the Earth. Tsau has developed a whole science of physics based on how the neutrino wind interacts with atomic particles, explaining everything from gravity to how light travels to how planets revolve around the sun.[391]

As we noted earlier in remarks about Newton, the much-ballyhooed 'inverse square law' is not really as stupendous as it is claimed to be, for it is simply a natural geometric phenomenon. The inverse square law applies not only to the decrease in the force of gravity with increase in distance, but of practically any substance that can travel away from its source at a constant angle of dispersion. For example, one could obtain the inverse square law from an action as simple as measuring the amount of paint dispersed from the nozzle of a can of spray paint. The density of the paint sprayed will be inversely proportional to the square of the distance at which the paint ends up from the nozzle. In other words, the inverse square law is based on a simple law of geometry, and has nothing to do with the nature of gravity, *per se*. Anything that radiates away from the source at a constant angle (*e.g.*, gravity, electricity, sound, force, light, gas density, charge) will follow the inverse square law, for at greater distances from the source, that which is dispersed must cover an increasing area and volume, and if it is distributed evenly in that larger volume, its density will decrease proportionately, by a rate that is the inverse to the square of the distance.[392]

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[391] Josef Tsau, *Discovery of Aether and its Science*, 2005. It is Tsau's belief that a neutrino wind generated by the sun pushes the planets in their orbital paths, thereby answering the mysterious phenomenon of inertia. He writes: "The high energy neutrino particles produced by the dense-matter object of the Sun affected by its rapid rotation and the strong force fields created by the rotation may form a constant spiral neutrino-particle wind that provides a directional pushing effect only, which may cause the outer layer of the Sun to rotate and is utilized by all planets to stay in orbit. If a planet is orbiting in the right direction, such a spiral wind at equilibrium would constantly give it a push in both its orbiting and anti-gravity directions to keep it in orbit" (p. 22).

As we can see, the Hildegardian model exceeds the Newtonian system. Hildegard gives us a physical reason for gravity, inertia and the combined movements of the constituents of the universe. Pluto moves slower than Mercury because Pluto is farther away from the vortex of the solar wind that pushes the planets. Near the sun the speed of the vortex is at its fastest, and this increased velocity, as Posch interprets Hildegard, "is necessary in order to carry the enormous heat away from the sun, otherwise the sun would become too hot and scorch everything on Earth."[393] In other words, the circulating current acts as a giant fan to radiate the proper amount of heat from the sun to the planets.

From Hildegard's vision, Posch explains the nature of the current:

> The counter-rotating wind current is narrow, like a belt. We should imagine the current as a disk-shaped rotating field in which the planets and the sun are carried. The planets, in fact, revolve on a plane, namely the ecliptic plane. This plane is unstable. It gyrates, and does so within a constant angle of 23.5°, forming a complete precessional movement around its fixed point, Earth, in one year. The Earth is the center of rotation for both the rotation of space and the point of intersection for the precessing counter-rotation of the ecliptic plane.[394]

The Cause of the Four Seasons

Here we have the explanation for the four seasons. The seasons are not caused by an Earth that is tilted 23.5° toward the North Star, but by the swaying movement of the ecliptic (that is, the path of the sun through the zodiac) as it changes the plane of its orbit by 23.5° every six months. The plane of the sun's path will precess up and down by 23.5° just as a spinning gyroscope wobbles up and down. The total amount that the sun's plane moves against the Earth's equator is 47.0º per year, or 0.2568º per day. (See enclosed CD animation for a demonstration). As Hildegard puts it: "The other planet moves counter to it and drags the sun upwards to the constellation of Aries…. These propel [accelerate] the sun forward with great force, like a bull….the two planets accompany the sun for a while so that it won't move downwards too fast." And beginning at the constellation of Virgo, "the sun moves more slowly [decelerates] on its path…"[395]

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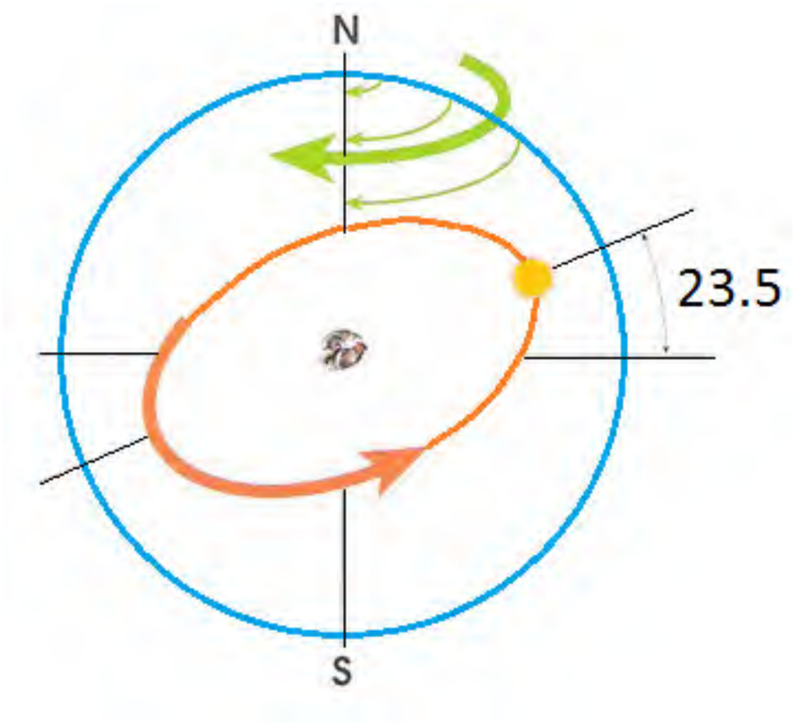
[392] This rule does not apply to plasma and magnetism, however, due to the internal workings of their specific properties.

[393] *Das wahre Weltbild*, p. 117. Since the period of the planet will be proportional to its distance from the center of the vortex, the vortex nearest to the sun is traveling very fast. Posch holds that within 1.5 kilometers the vortex is moving at the speed of light. At 3 million kilometers it is moving at 210.66 km/sec, and at Mercury, which is 57.9 million kilometers, it is moving at 47.94 km/sec, which is equal to the orbital speed of Mercury around the sun. These values are reached by dividing the constant 364.87 by the square root of the distance (*ibid.*, p. 130-131).

[394] *Das wahre Weltbild*, p. 117.



If this is true, then what force is making the sun's plane of orbit change? This force, Hildegard's vision reveals, comes from the same counter-current described above. She writes:

> The sun emerges as the largest planet; it heats up the firmament and its fire and strengthens it, and with its radiance it illuminates the Earth…By means of the strength of the revolution of the firmament the sun is driven in a slanted orbit from east to west

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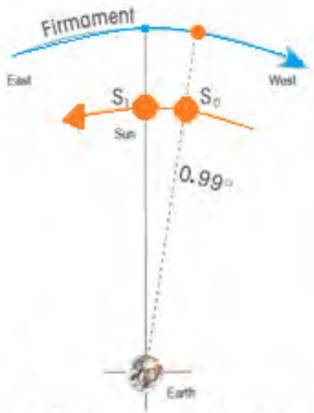
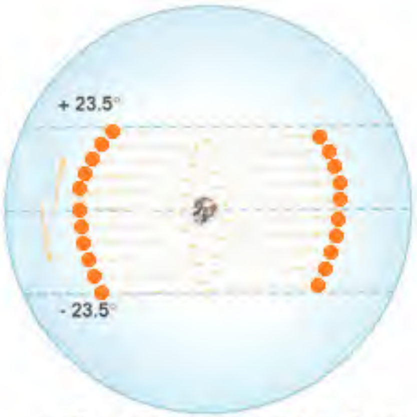
[395] *Das wahre Weltbild*, p. 143.

> through the south, even though in its journey it makes an effort to move counter to the motion of the firmament.[396]



Firmament rotates 0.99 degrees each day towards the west



The sun moves 23.5 degrees about every 91 days. It tightens its orbit as it moves

Hence, as the countercurrent moves against the firmament's current, it creates an eddy of force around the sun. This force pushes the sun up and down within the margin of 47.0º each year. As Posch describes the force of the solar eddy:

> A further consequence of this eddy current is the swinging-out-at-the-side of the entire plain vis-à-vis the equatorial rotation of space. The effect resembles kite-flying. If you walk against the wind with the kite, it goes up in a slanted manner. Current and counter-current result in a sideways movement. That is why the sun does not move counter to the rotation of space in an equatorial plain but rises by about 0.2568 degrees with respect to the celestial equator. This ascension remains constant throughout the whole year. Thus the sun virtually spirals upwards counter to the rotating direction of the firmament day after day by approximately 0.25 degrees. After half a year (183 days) it has risen from -23.5 degree to +23.5 degrees, that is, by as much as 47 degrees. (47:183 = 0.2568). Hildegard writes that the contra-

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[396] *Die göttlichen Werke* 96, 100; *Das Weltbild*, p. 119.

> rotating wind current is narrow like a belt. We need to image the cyclone current as a disk-shaped field of rotation in which the planets and the sun are carried. The planets in fact revolve on a plane, namely the ecliptic plane. This plane, however, is unstable and forms in a constant angle of 23.5 degrees a complete precession movement around the fixed-point earth within one year. The earth is the center of rotation for the rotation of space and at the same time the point of intersection for the precessioning counter-rotation of the ecliptic plane. Thus the sun is raised from -23.5 degrees to +23.5 degrees in the first period of six months and returns to its point of origin after the summer solstice. This is how the four seasons are formed.[397]

Still another function of the counter eddy current is heat distribution to the planets. As Posch puts it:

> The planets, too, move counter to the rotating direction of the firmament, because they are caught up in this counter-current. The farther away from the sun a planet is, the slower it becomes, because the angular velocity of the eddy current decreases as the distance increases. Near the sun the eddy current twirls the fastest. Close to above the sun's surface it circulates in light-speed, as calculations will yet show. Hildegard mentions, among other things, that this is necessary in order to carry the enormous heat away from the sun. Otherwise the sun would become too hot and scorch everything on earth.[398]

The Universe Flips Over

As the firmament rotates, Hildegard's visions show another dimension of its action:

> Further I saw the south wind with its side winds, starting the day of the winter solstice, gradually lift the primordial vault from south towards north, supporting both, as it were, until the summer solstice….From the same day onward, when the days start to become shorter, the north wind with its side winds, eschewing the sunlight, pushes this vault from north to south,

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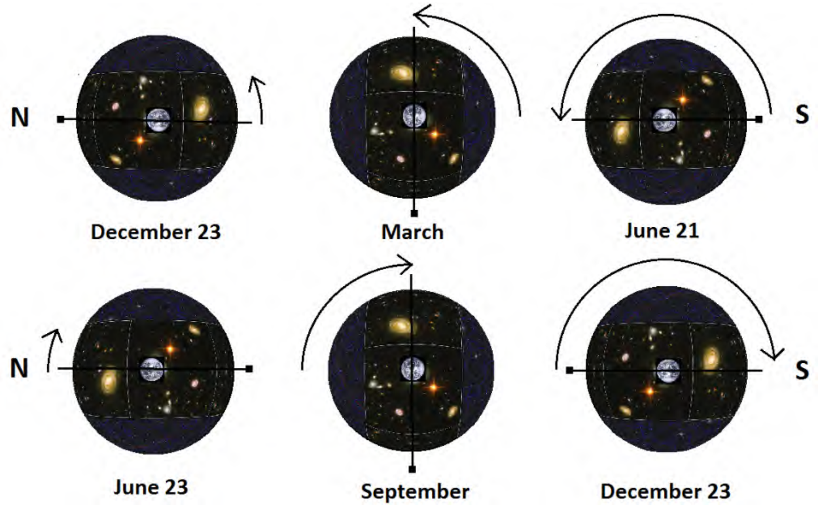
[397] *Das wahre Weltbild*, p. 117-118.

[398] *Ibid.*, pp. 116-117.

> until, the days getting longer, the time has once again come for the south wind to push it back up.[399]



This is most amazing. Hildegard is telling us that the whole universe is flipped over every six months. The flipping occurs between the north and south poles of the universe. The side of the universe that was nearest the north region is, six months later, nearest to the south region, and vice-versa six months later. The slow flip is caused by the universal winds. The universal south wind pushes the south universal pole toward the north; while the universal north wind pushes the north universal pole toward the south. Later we will see precisely how these cosmic winds are able to push the universe.

The reason the universe must swing back and forth is to keep it balanced and as one spherical whole. As Posch puts it:

> Hildegard says man will never fully understand the structure of the universe. If we consider the numerous theses and hypotheses about the formation of the world, we must agree with Hildegard's statement. Without Hildegard's concrete information we would probably never find out, aside from the already-discussed movements, the cosmos also carries out a kind of swinging motion, which we men do not even notice. What's it about? What are these mysterious processes of which we are allegedly unaware? Due to the unbalanced rotation of the

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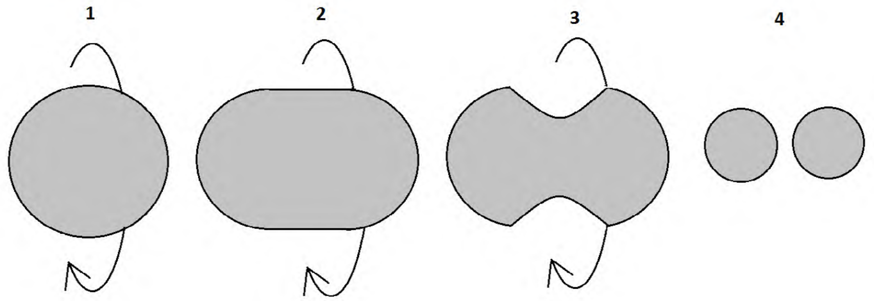
[399] *Das wahre Weltbild*, p. 119.

> firmament from east to west, over a long period of time the spherical shape of the universe could not be maintained without some countermeasure. Let us think of bread dough that is always rotated in the same direction only. The spherical shape gradually turns into an elongated strudel, which eventually disintegrates into two pieces. In the cosmos, the unbalanced rotation would have similar variations of shape as a consequence. In order to prevent a deforming and melting of the cosmos, the north and south winds alternately exert pressure so that the entire universe is permanently remoulded.



Here is yet another interesting facet to Hildegard's cosmology. In her vision, the north and south poles of the Earth do not lie in a vertical direction but horizontal. Thus, the universe rotates daily around the north-south pole like chicken on a rotisserie or a wheel rotating on an axle, and which axle slowly changes its polar orientation on a semi-annual schedule. The horizontal position of the north-south axle will allow the four compass points to form a horizontal plane, which then explains why Scripture sometimes refers to the "four corners of the Earth." A square with a corner positioned at each of the compass points is horizontally circumscribed in a sphere.[400] Another means of compensating for Scripture's language is that the "corners" are the tips of the four hemispherical cones that converge at the center of the Earth.

Modern cosmologists seem to have found recent evidence for the twisting or flipping of the universe. In 1997 physicists Borge Nodland and John Ralston discovered that radio waves traveling through space rotated the plane of their polarization.[401] C. Wolf believes this phenomenon to be of such importance that it may force "modifications to particle theory and cosmology" and "possible alterations of fundamental physical theory…in the future."[402] Even though Nodland and Ralston's rotation was small (one period of polarization rotation completed in about ten billion years), they could be measuring merely the slight differences in Hildegard's semi-annual universe rotation. In other words, the universe's polar rotation is so precise that the finest instruments detect only a one in 10^{10} variation. Whatever the correct application, the news of rotating electromagnetic waves was not well received from the science community, since it would automatically deny Einstein's cherished theory of General Relativity that claims there is no center or distinction in the universe.

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[400] Is 11:12; Ap 7:1; 20:8.

[401] "Indication of Anisotropy in Electromagnetic Propagation Over Cosmological Distances," *Physical Review Letters* 78, 16:3043-3046, April 21, 1997. For a selected data set, the axis they found had a declination and right ascension of (d,

The reason the universe must make this annual 180° change is that its constant daily rotation in one direction (east to west) causes an increasing momentum, which, if there were no compensating factor, would begin to deform the universe's spherical shape. The universe would become elongated and eventually break into two or more pieces. Hildegard puts it:

> For if the sun did not impede the firmament by its resistance to it, or if it ran counter to the firmament even with the other planets and with the same velocity with which it rotates, everything would be mixed up and the entire firmament would burst asunder. For if the firmament were immovable so that it would not rotate, then the sun would be above the Earth almost throughout the entire summer, without it becoming night, and almost during the entire winter under the Earth, without it being day.

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a) = (0° ± 20°, $21^h \pm 2^h$), within 45° of the "opposite" pole. The statistical probability that the two axes are only accidentally within 45° of each other is not negligible. Ralston and Nodland added that the twisting of the waves increased the more it receded further into the universe, suggesting that the rotation was a truly universal phenomenon. They also pointed out that the rotation was specific to the direction one looked. It twisted right if one looked in one direction, but left if one looked in the opposite direction. In 1982, Paul Birch was the first to report the basis for such a phenomenon when he observed a correlation of the polarization angle with the source location angle relative to a preferred axis in the universe (*Nature*, London, 298, 451, 1982). Kendall and Young confirmed Birch's results two years later (D. Kendall and G. A. Young, *Monthly Notices of the Royal Astronomical Society*, 207, 637, 1984), as did M. Beintenholz and P. Kronbert (M. Beintenholz and P. Kronberg, *Astrophysics* J, LI, 287, 1984).

[402] C. Wolf in "Polarization Rotation Over Cosmological Distances as a Probe to New Physics," *Aperion*, Vol. 8, No. 3, July 2001, p. 95. Nature also has other such "flipping" motions. The magnetic fields of the sea floor switch their poles. The magnetic field of the sun switches its poles once every 22 years.

> Now, however, the firmament rotates in such a manner that it moves counter to the sun…for which reason the firmament compresses itself through the heat of the sun and is made more resistant all the more quickly, that is to say: when the sun traverses the firmament and wholly penetrates it and pours through it with its fire.[403]

The Behavior of Man and the Reaction of the Cosmos

In Hildegard's next series of statements, she reveals one part of the interconnection between the events in the cosmos and the behavior of mankind. After the fall of man in Eden, nature was altered or damaged in various ways. Death entered the world, animals became fearful of men, the ground produced thorns and thistles, and the whole universe was made subject to gradual deterioration.[404] Hildegard tells us that the same is true with the firmament:

> Before the fall of Adam the firmament was immovable and did not rotate. After his fall, however, it started to move and to revolve. From the Last Day onward, however, it will again stand still as it was on the first day of creation and before Adam's fall.[405]

This means that the light of the first three days of creation, and, after that, the sun and stars of the Fourth day up until the sin of Adam, were revolving around the Earth without being carried by the firmament. Apparently, the firmament was in a pristine condition prior to the Fall and this condition changed drastically afterwards. As it stands now, unless the firmament rotates it will become unstable and disintegrate. As Hildegard puts it:

> Now, however, it rotates so that it will receive its power from the sun, the moon and the stars, because, if it stood still, it would become liquefied and weakened, melting in a short time.[406]

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[403] *Ursachen u. Behandlung der Krankheiten*, 24, *Das wahre Weltbild*, p. 121.

[404] *Cf.* Gn 3:17-19; Jr 12:4; Rm 8: 19-22; Ac 3:21.

[405] *Ursachen u. Behandlung der Krankheiten*, 24, *Das wahre Weltbild*, p. 121.

[406] *Ursachen u. Behandlung der Krankheiten*, 24, *Das wahre Weltbild*, p. 121. The condition of the firmament may have also affected the speed of light. In the more ideal condition prior to the Fall, the speed of light through the firmament would have been much faster, which would help account for the fact that starlight would have appeared on Earth on the fourth day of creation, otherwise, in contradiction

> The firmament is subservient and compliant with the shiners [stars] for the benefit of the Earth, and serves the Earth, as the fire stabilizes it [the firmament], the air restrains it, and the water dashes it; the firmament performs as one who serves and the Earth stands as someone who is seated and ruling.[407]

According to Posch's interpretation of Hildegard:

> Through its [the firmament's] rotation, the elements are purified; otherwise we would have suffocated in the world's stench long ago. The elements interact with the cosmic elements, as we know by now, and are constantly "filtered" and "distilled" thereby.[408]

The Constitution of the Firmament

Our present knowledge of science may also confirm what Hildegard's vision reveals about the firmament. Very special factors are necessary to have such a versatile and undetectable medium permeate the entire universe. Notably, this subject is approached, albeit indirectly, by one of the world's most respected physicists, John A. Wheeler, professor emeritus of Princeton University and co-author of the most comprehensive book written on gravitation to date. In an article he wrote with C. M. Patton titled: "Is Physics Legislated by Cosmology?" Wheeler, interestingly enough, begins with an offhand comment about the first two days of Genesis. He writes:

> No one sees any longer how to defend the view that 'geometry was created on Day One of creation, and quantized on Day Two. More reasonable today would appear the contrary view, that 'the advent of the quantum principle marked Day One, and out of the quantum principle geometry and particles were both somehow built on Day Two.[409]

In a simplified way we can summarize Wheeler's concern by noting that his remarks show that physics has wrestled with the proverbial

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to Genesis 1:14-19, they could not have been used as timekeepers (*e.g.*, sidereal time) by the patriarchs. Since light travels faster or slower depending on the medium, there is no scientific anomaly in the above scenario.

[407] *Berliner Fragmente*, 38, *Das wahre Weltbild*, p. 131.

[408] *Das wahre Weltbild*, p. 132.

[409] J. A. Wheeler and C. M. Patton, "Is Physics Legislated by Cosmology," in *The Encyclopedia of Ignorance*, 1977, p. 22.

problem of the chicken and the egg. Which came first, the chicken (geometry) or the egg (the composition of the universe that allows geometry and, even more basic, the concept of extension)? Technically speaking, an *ex nihilo* understanding of Day One and Day Two would have no such concern, since things are merely called into being by divine fiat and made to work with whatever material is present on the respective Days of creation. Nevertheless, Wheeler's point about the "quantum principle" does not go unappreciated by an *ex nihiloist*, for the point of his remark is that the "geometry" of the cosmos has a substratum which is defined by the principles of quantum mechanics, and which thus allows for the phenomena of extension and collapse. As Wheeler puts it:

> The black hole, as "experimental model" for gravitational collapse, brings us back full-circle to the paradox that continually confronts us, and all science, the paradox of big bang and gravitational collapse of the Universe itself. The existence of these two levels of collapse reminds us, however, that theory gives us also what is in effect a third level of collapse, small-scale quantum fluctuations in the geometry of space taking place and being undone, all the time and everywhere.[410]

We, of course, are only interested in Wheeler's "third level of collapse," since it relates directly to the constitution of the firmament of Day Two, or what Wheeler sees as the means by which the "…quantum principles of geometry and particles were…built." In this regard, Wheeler states:

> Among all the great developments in physics since World War II, there has been no more impressive advance in theory than the analysis of the fluctuations that take place all the time and everywhere in the electromagnetic field. There has been no more brilliant triumph of experimental physics than the precision measurement of the effect of these fluctuations on the energy levels of the hydrogen atom….These developments tell us immediately that the electron in its travels in a hydrogenic atom is subject not only to the field Ze/r^2 of the nucleus, but also to a fluctuation field that has nothing directly to do with the atom, being a property of all space.[411]

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[410] J. A. Wheeler and C. M. Patton, "Is Physics Legislated by Cosmology," p. 24.
[411] *Ibid*., p. 24.

In other words, the electron not only has to interact with the nucleus, but with the field of space between the nucleus and the electron, yet a field that "has nothing to do with the atom" itself, but is a property of the independent existence of something other than the atom. So, according to Wheeler, we have protons, neutrons, electrons and an undefined but experimentally proven "field" which constitutes the fabric "of all space." We will see shortly that Wheeler's explanation is precisely what Hildegard's visions tell us of the constitution of the universe and the physical cause for gravity, nearly one thousand years before "the great developments in physics since World War II"! The only difference is that, whereas Wheeler sees "changes in connectivity with 'handles' and 'wormholes' in the geometry all the time and everywhere forming and disappearing, forming and disappearing ('foam-like structure of space')," [412] Hildegard's visions tell us that the "foam-like structure of space" is permanent and non-fluctuating. It doesn't "disappear" into "other universes" and come back a split second later. It is here to stay because it was made, *ex nihilo*, on Day Two, and which we call the Firmament.

Wheeler goes on to explain the dimensions and magnitude of this "field…of all space…is the Planck length," [413] which is what we have been arguing as one of the basic constituents and dimensions of the firmament's granularity.

He continues:

> One who had never heard of electricity, looking for evidence of this multiple connectivity of space, would *predict* electricity as [a] consequence of it. Thereupon *finding* electricity in nature, he would take this discovery as evidence that space really is

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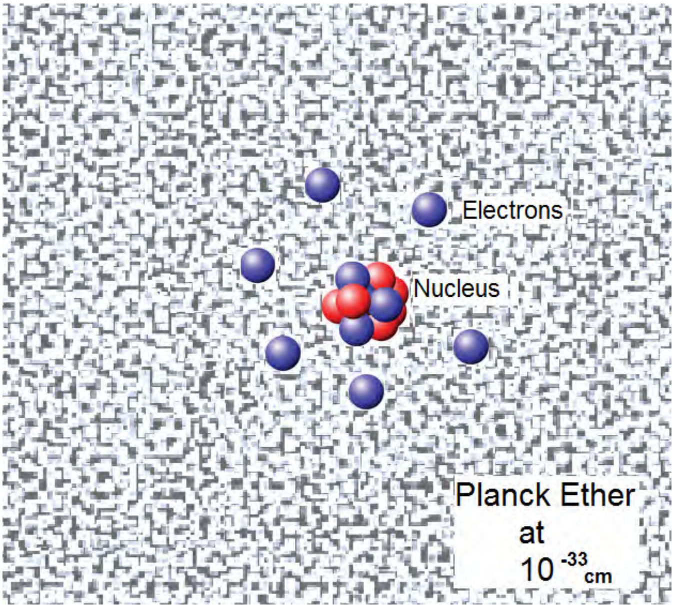
[412] *Ibid*., p. 25.

[413] "In a region of observation of dimension *L* the calculated fluctuation field is of the order, $\Delta\varepsilon \sim (hc)^{1/2}/L^2$… The consideration of principle that give one in electrodynamics the fluctuation formula [$\Delta\varepsilon \sim (hc)^{1/2}/L^2$] tell one that in geometrodynamics, in a probe region of extension *L*, the quantum fluctuations in the normal metric coefficients –1, 1, 1, 1 are of the order, $\Delta g \sim L^*/L$. Here $L^* = (hG/c^3)^{1/2} = 1.6 \times 10^{-33}$ cm is the Planck length. These fluctuations are negligible at the scale of length, L, of atoms, nuclei, and elementary particles, as the wave-induced fluctuations in the level of the ocean appear negligible to an aviator flying 10 km above it. As he comes closer, or as L diminishes, the fluctuations become more impressive. Finally, when the region of analysis is of the order of the Planck length itself, the predicted fluctuations are of the order $\delta g \sim 1$."

multiply connected in the small. Nothing prevents our rising above the accidents of history to take the same position.[414]



These fluctuation charges are not a property of elementary particles. The relevant scale of distances is twenty orders of magnitude less than nuclear dimensions. The charges are not quantized in magnitude. The charges occur everywhere, not only where there is a particle.[415]

The view that large fluctuations go on at small distances puts physics in a new perspective. The density of mass-energy associated with a particle…is as unimportant compared to the calculated effective density of mass-energy of vacuum fluctuations down to the Planck scale of lengths…10^{94} g/cm^3…as the density of a cloud, ~ 10^{-6} g/cm3, is unimportant compared to the density of the sky, ~ 10^{-3} g/cm^3…the proper starting point in dealing with physics…is the sky, not the cloud…no theory of

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[414] Concluding with: "Accordingly we are led to think of space as having a kind of fluctuating foam-like structure, with everywhere positive and negative charges of order $q \sim (hc)^{½} \sim 10e$ continually being created and annihilated."

[415] "Is Physics Legislated by Cosmology?" p. 26.

> particles that deals only with particles will ever explain particles.[416]

Not only do we have Wheeler admitting that science gives us no answer for the origin of electricity (something Hildegard has answered by saying it is a form of plasma), we have him describing the basic constituents of Hildegard's firmament. Our quest now is to show how Hildegard's vision of the firmament "melting" if it did not rotate is true in scientific terms. Gerardus Bouw has done the most productive work in this area. Using Wheeler's equation,[417] Bouw writes:

> The *Planck density*, as this density is called, is today regarded as due to fluctuations in a vacuum caused by the uncertainty principle. Because of this, some have looked to this density as an explanation of the origin of the big-bang, assuming that the latter started at that density. But if the universe started at the Planck density, then it would also have to start at the Planck length and then the total mass of the universe would only be of the order of 10^{-5} grams. Furthermore, there is nothing vacuous about the firmament and so it is more logical to assume this to be a pervasive density which on sub-nuclear scales the universe can only suspect; but of whose existence it can never be certain. This, then is the density of the firmament.[418]

Obviously, if the firmament has such a tremendous density (10^{94} g/cm^3) one wonders how anything could move through it. A mere teaspoon full would weigh hundreds of millions of tons. As we noted earlier, however, science itself has found the answer since the discovery in 1923 of deBroglie waves. Material objects, from things as small as the electron to as large as stars, move in wave motion through the firmament.

Since the firmament is rotating, this will create a centrifugal force. Hence, to remain stable, the firmament will require an equal and opposite force to keep it from disrupting. Or, perhaps a better way to phrase it is by Hildegard's description: "if it stood still, it would become liquefied and weakened, melting in a short time."[419] This opposite force will come from the universal winds that blow inward and create a ubiquitous pressure (the force which we understand as gravity) to keep the firmament from radiating outward, as well as the internal cohesion of the firmament itself that holds it together. If one of the fundamental substrates of the firmament is in the Planck dimensions, then a certain rotation period will be required to compensate for the inward pressure (gravity). The amount of centrifugal force created by the rotation will not equal the inward pressure; otherwise there would be no gravity. Rather, the rotation will be just enough to allow a residual inward pressure in order to give us the strength of gravity we see today. The rate of rotation required of the firmament to reach this equilibrium is approximately 24 hours, which means it will turn 4.166×10^{-3} degrees per second, or 7.27×10^{-5} radians per second. Since the centrifugal and centripetal forces are balanced in favor of gravity in the rotating firmament, then the firmament's angular momentum should be proportional to the gravitational constant (G), the density (ρ) and the mass (M).

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[416] *Ibid.*, p. 27. In his arrival at the density of the substratum of 10^{94} g/cm^3, Wheeler uses the equation $\rho \sim [(hc/L^*)/c^2]/L^{*3} \sim M^*/L^{*3} \equiv 2.2 \times 10^{-5}\ \text{g}/(1.6 \times 10^{-33}\ \text{cm})^3 \sim 10^{94}\ \text{g/cm}^3$.

[417] $\rho \sim [(hc/L^*)/c^2]/L^{*3} \sim M^*/L^{*3} \equiv 2.2 \times 10^{-5}\ \text{g}/(1.6 \times 10^{-33}\ \text{cm})^3 \sim 10^{94}\ \text{g/cm}^3$.

[418] *Bulletin of the Tychonian Society*, No 43, 1987, p. 17. In a related series of equations, Bouw finds that the energy flux of the firmament is 3×10^{125} ergs/cm^2/sec.

A similar discovery in physics may help us understand how the rotation of the universe helps keep it stable. In the book, *The Ether of Space*, after speaking about the tremendous elasticity and density of the ether as an "incompressible," "perfectly frictionless inviscid fluid," and "a perfect continuum, an absolute plenum,"[420] Sir Oliver Lodge states the following:

> But we must go on to ask, To what is this rigidity due? If the ether does not consist of parts, and if it is fluid, how can it possess the rigidity appropriate to a solid, so as to transmit transverse waves? To answer this we must fall back upon Lord Kelvin's kinetic theory of elasticity: that it must be due to rotational motion – intimate fine-grained motion throughout the whole ethereal region – motion not of the nature of locomotion, but circulation in closed curves, returning upon itself – vortex motion of a kind far more finely grained than any waves of light or any atomic or even electronic structure.[421]

Lodge, of course, did not believe that the universe rotated around the Earth. He made the same mistake that all other scientists made when interpreting the Michelson-Morley experiment. Several times in his book

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[419] *Ursachen u. Behandlung der Krankheiten*, 24, *Das wahre Weltbild*, p. 121.
[420] Sir Oliver Lodge, *The Ether of Space*, 1909, pp. 47, 90, 95.
[421] *Ibid.*, pp. 102-103.

Lodge refers to the Earth moving “nineteen miles a second” around the sun as his basis for interpreting the famous interferometer experiment.[422] Thus, the “rotation” to which Lodge refers here is to the vortex motion of the ether itself, but according to Kelvin’s kinetic theory, the required rotation could just as well be satisfied by a rotating universe.

Lodge makes further comments regarding ether, matter and rotation:

> The Essential distinction between matter and ether is that matter moves, in the sense that it has the property of locomotion and can effect impact and bombardment; while ether is strained, and has the property of exerting stress and recoil. All potential energy exists in the ether. It may vibrate, and it may rotate, but as regards locomotion it is stationary – the most stationary body we know: absolutely stationary, so to speak; our standard of rest.[423]

Here, of course, we see that, identical to Lorentz and other physicists of this day, the ether was understood to be stationary while the Earth moved “nineteen miles per second” through it, which is why they were all so disconcerted when the Michelson-Morley experiment did not detect any such movement. Instead of having the Earth as their “standard of rest,” they chose a stationary ether. Still, they possessed the scientific intuition that space contained a medium, and their quest was to understand the nature of that medium. They reasoned that it remained stable because of its rotation, which rotation allowed this “frictionless fluid” to also act as a solid. Lodge elaborates as follows:

> But now comes the question, How is it possible for matter to be composed of ether? How is it possible for a solid to be made out of fluid? A solid possesses the properties of rigidity, impenetrability, elasticity, and such like; how can these be imitated by a perfect fluid such as the ether must be?
>
> The answer is, They can be imitated by a fluid in motion; a statement which we make with confidence as the result of a great part of Lord Kelvin’s work. It may be illustrated by a few experiments. A wheel of spokes, transparent or permeable when stationary, becomes opaque when revolving, so that a ball thrown against it does not go through, but rebounds. The motion

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[422] *Ibid.*, pp. 55, 58, 61, 63, 66, 68.

[423] *Ibid.*, p. 118.

> only affects permeability to matter; transparency to light is unaffected. A silk cord hanging from a pulley becomes rigid and viscous when put into rapid motion….A flexible chain, set spinning, can stand up on end while the motion continues. A jet of water at sufficient speed can be struck with a hammer, and resists being cut with a sword. A spinning disk of paper becomes elastic like flexible metal, and can act like a circular saw.[424]

Of course, the remaining question for Lodge and the scientists of his day was how the ether could spin. As they understood it:

> If the ether can be set spinning, therefore, we may have some hope of making it imitate the properties of matter, or even of constructing matter by its aid, But *how* are we to spin the ether? Matter alone seems to have no grip on it. As already described, I have spun steel disks, a yard in diameter, 4000 times a minute, have sent light round and round between them, and tested carefully for the slightest effect on the ether. Not the slightest effect was perceptible. We cannot spin ether mechanically.[425]

We have already seen, however, that Lodge's experiments were sullied by his assumption that the Earth was moving at "nineteen miles per second" and thus his, and other experiments, would not be able to detect any significant effect on the ether. The point here is that Lodge and his colleagues recognized that the plenum of ether could perform as a rigid, solid mass if it were spun. Again, this mechanism is precisely what the Hildegardian system supplies to the universe of ether – a daily spin to keep it rigid and, as Hildegard puts it, "to keep it from melting" (that is, turning into a fluid).

In addition to the above, rotation is also involved in the relationship between electricity and magnetism, which will allow us to draw out further answers to the versatility of the geocentric universe. As Lodge explains the relationship:

> Rotation is supposed to exist whenever we put a charge into the neighborhood of a magnetic pole. Round the line joining the two, the ether is spinning like a top. I do not say it is spinning fast: that is a question of its density; it is, in fact, spinning with excessive slowness, but it is spinning with a definite moment of

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[424] *The Ether of Space*, pp. 118-119.

[425] *Ibid.*, p. 120.

> momentum. J. J. Thomson's theory makes its moment of momentum exactly equal to *em*, the product of charge and pole; the charge being measured electrostatically and the pole magnetically.
>
> How can this be shown experimentally? Suppose we had a spinning top enclosed in a case, so that the spin was unrecognizable by ordinary means – it could be detected by its gyrostatic behavior to force. If allowed to "precess" it will respond by moving perpendicularly to a deflecting force. So it is with the charge and the magnetic pole. Try to move the charge suddenly, and it immediately sets off at right angles. A moving charge is a current, and the pole and the current try to revolve round one another – a fact which may be regarded as exhibiting a true gyrostatic action due to the otherwise unrecognizable etherial spin. The Fact of such magnetic rotation was discovered by Faraday.[426]

This principle may explain why the Earth has a magnetic force pivoting off its poles and surrounding its entire circumference. Simply put, the rotation of the universe with its accompanying ether, which carries an electric field with its own impedance,[427] will create a magnetic force on the poles of a stationary Earth.

Hildegard and the Cause of Gravity

As we have noted earlier, Isaac Newton did not discover the nature of gravity. He merely gave us a mathematical formula to calculate its effects. Although Newton and his devotees usually describe gravity as an attractive force, the most that can be said for this view is that it satisfies the appearances. The main problem with viewing gravity as a local force due to some innate property of matter is that it would not begin to explain how gravity can operate over vast distances, otherwise known as the "action-at-a-distance" problem, something Newton hardly addressed, let alone solved.

Recall in our earlier discussion concerning the makeup of the atom that there exists a huge volume between the nucleon and the electron. In 1911 Ernest Rutherford, after bombarding very thin sheets of gold with alpha particles, discovered that even though the alpha particles were 8,000 times larger than the electron, and the metal foil was 400 atoms-thick, nevertheless, most of the particles penetrated the foil with little problem. Only a few, perhaps 1 in 1,000, were scattered, some deflected 90 degrees, others 180 degrees. An obvious interpretation of this phenomenon is that most of the alpha particles move through the atom as if it were almost completely empty. The few alpha particles that were deflected had done so because they hit the nucleus of the atom, which means that most of the mass of the atom is concentrated at the central point. As it turns out, only a quadrillionth of the atom is occupied by mass, that is, only 0.000,000,000,000,1%. What constitutes the other 99.999,999,999,999,9%? Hildegard's vision tells us that it is the fourth element, "air," or what we would understand as a subatomic ether that pervades the whole universe, yet it does not penetrate the nucleus or the electron but only the space between the two. In a simple analogy, we could say that the "fire" of the electron is bathed in a sea of cosmic "air" in order that it can continue to "burn." As Hildegard describes it: "In each of the elements there indwells an air that corresponds to its nature."[428] Every cubic centimeter of space, and even matter itself, contains trillions upon trillions of these little entities, forming an invisible medium throughout the universe. As Oliver Lodge wrote, quoting J. J. Thomson:

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[426] *The Ether of Space*, pp. 121-122.

[427] According to "Space Must Be Quantizied," *21st Century*, May-June, 1988, p. 26ff, the impedance of space is 376 ohms.

> "In fact, all mass is mass of the ether; all momentum, momentum of the ether. This view, it should be said, requires the density of the ether to be immensely greater than that of any known substance."
>
> Yes, far denser – so dense that matter by comparison is like gossamer, or a filmy imperceptible mist, or a milky way. Not unreal or unimportant – a cobweb is not unreal, nor to certain creatures is it unimportant, but it cannot be said to be massive or dense; and matter, even platinum, is not dense when compared with the ether.[429]

This subatomic ether performs a number of important tasks, but probably the most important is that it helps create gravity. As it occupies the space in the atom, as in Rutherford's experiment, most of it passes through, but some of it hits the nucleus, yet it cannot penetrate the nucleus because of the latter's density. This fits the science we already know concerning protons. They are virtually indestructible and do not decay. Experiments with the proton reveal that its average lifetime must exceed 10^{32} years.[430] Although the nucleus is about 10^{-14} cm in length, its density is far more compact. No one really knows how dense it is. In any case, the atom moves in whatever direction the ether moves the nucleus. There is no longer any need to wonder why atoms were designed with mostly "empty space." They were designed as such to allow them to be penetrated by even smaller unseen entities to create the phenomenon of gravity.[431]

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[428] "Einem jeden der höheren Elemente wohnt eine Luft inne, die seiner Beschaffenheit entspricht" (*Die göttlichen Werke*, 122, cited in *Das wahre Weiltbild*, p. 103).

[429] *The Ether of Space*, p. 116.

As we noted above, modern science has found substantial evidence that open space is not a vacuum; rather, it is filled with infinitesimal particles. It was for this very reason that the interferometer experiments in the course of 50 years all demonstrated positive results for an ether circling the Earth, but results that were not even close to coinciding with an Earth revolving around the sun at 66,000 mph. We also noted earlier that Carl Anderson discovered the positron in 1932. From this discovery various scientists have understood that space is packed with electron-positron pairs (or what we have coined as "electropons"), such that the sudden appearance of an electropon pair when a 1.02 MeV charge is administered in open space is that the charge is jarring the particles loose from the all-pervading electropon lattice. One scientist, Menahem Simhony, estimates that the number of electropon pairs in one cubic millimeter of space is 6×10^{30}, with a binding energy of 27 quadrillion kilowatt hours, yet this energy is a million times smaller than the binding energy of the atomic nucleus.[432] Hence, the nucleus would remain impenetrable to the electropons, and thus the electropon sea could move the nucleus. Thus we have a viable mechanism for gravity. Later we will discover what might move the electropon sea against the nucleus.

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[430] James S. Trefil, *The Moment of Creation: Big Bang Physics from Before the First Millisecond to the Present Universe*, 1983, pp. 141-142. Although protons have been theorized to consist of other particles (*e.g.*, leptons, quarks), nevertheless, in the cosmic realm the proton remains indestructible. Whereas 100 MeV is needed to remove an electron from an atom, and 10^6 MeV to remove protons from neutrons, it would take 10^{11} MeV to break down a proton. By comparison, the best modern accelerators can presently produce 10^{12} MeV.

[431] For an example of how this principle can be demonstrated, Posch cites that the Earth consists of only 10^{-14} % mass, based on the current atomic model in use today. This, of course, leaves 9.9×10^{15} % as empty space. If, in turn, the ether penetrates the Earth with a pressure of 10^{14} p, only 10^{-14} of this pressure is absorbed by the Earth's mass. The difference between the unhindered permeation and the resisted amount is as small as 10^{14} % [corrected]. As such, 10^{-14} % of 10^{14} $p = 1$ p. This equation corresponds exactly to the Earth's measured gravity, which is 1 p or 1 gram per square centimeter (*Das wahre Weltbild*, p. 104).

[432] Menahem Simhony, *Invitation to the Natural Physics of Matter, Space and Radiation*, 1994.

Simhony's value of 10^{30} electropons per cubic millimeter of space is precisely the same value found by another researcher in the field, Allen Rothwarf (although the two scientists worked independently).[433] Moreover, setting their sights on specifically addressing the gravity question, Frederick Rothwarf and Sisir Roy combine the electropon pairs into a second ether composed of particles on the Planck scale, so that there are "two ethers." Offering a solution to gravity, they write:

> These particles, called partons or gravitons, are assumed to have a mass equal to the Planck mass[434] and to constitute an ether A_G, that transmits gravitational forces at a speed c_G, which exceeds the speed of light c_0. Along similar lines, Van Flandern and Vigier have analyzed planetary and cosmological data to obtain a lower limit of c_G, $2 \times 10^{10}\ c_0 = 6 \times 10^{18}$ m/s" [*i.e.*, 20 billion times the speed of light].[435]

Einstein, of course, had limited the speed of gravity to luminal parameters, but many physicists admit that this limitation simply will not survive in a universe of Planck dimensions, and it is one of the reasons why Relativity and Quantum Mechanics have never had a successful union.

That gravity is based on an ether-pressure is related to the various corpuscular theories of gravity originating in the work of Nicholas Fatio de Duillier (b. 1664) and Georges-Louis Le Sage (b. 1724), and continuing in modern times to the more advanced theories. For example, astrophysicist Toivo Jaakkola writes:

> A few words about the gravitational ether, and the ether concept in general may be in place here. The ether hypothesis was thought to be buried by the Michelson-Morley experiment, but today it is more alive than ever, in the form of the CBR [Cosmic Background Radiation]: experiments capable of finding the ether

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[433] Allen Rothwarf, "Cosmological Implications of the Electron-Positron Ether," *Physics Essays*, 11, 1998. John Kierein finds a similar density to the electron-positron model, and by it shows that redshift is due to the Compton effect (John Kierein, "Implications of the Compton Effect Interpretation of the Redshift," *IEEE Trans. Plasma Science* 18, 61 (1990).

[434] $m_p = (hG/c)^{½}$

[435] "The Time Dependence of Fundamental Constants and Planck Scale Physics," in the paper dated November 14, 2003, p. 8.

> were not possible in the 1880s, but were possible in the 1960s. In a sense, the electromagnetic ether has always been observed – as the heat of the Sun (since as pointed out, CBR is reprocessed photons).
>
> The gravitational ether must be structured much like its electromagnetic counterpart. Local fields would cause the ordinary gravitational processes. Corresponding to CBR, there must be a cosmic background gravitation, CBG, probably with its specific gravitational spectrum. How to observe CBG? It has been already observed, as the cosmological redshift effect, z.
>
> Gravitation works *via* gravitational quanta, gravitons…. Quantized gravitation is also required by the redshift and other equilibrium effects. Gravitons are gravitational equivalent to electromagnetic quanta, photons, both those of the cosmic background radiation CBR and incident photons from galaxies. Gravitons and baryonic matter interact and are in equilibrium on the cosmological scale. The graviton-baryonic interaction is the redshift effect, and the CBR is re-emission of energy gained by the cosmological gravitons in the redshift effect.
>
> Gravitation on a body is a pressure effect of gravitons flowing from the background space. As a rule, due to the equilibrium principle, the flow is proportional to the mass of the body. As for all concentric flows (*e.g.*, radiation) the surface density of the graviton inflow follows the familiar inverse square distance law….The energy of the gravitons is proportional to the parameter which we call "strength of gravitation," G. Therefore, we obtain for the surface gravity on a spherical body with mass M and radius R the familiar Newtonian $a = GM/R^2$.
>
> All the main cosmological, astrophysical and physical facts: the gravity and Olbers paradoxes, redshift effects and CBR, gravitation and radiation, and the existence of particles can be conceived in the framework of this ether concept.[436]

In summary, Jaskkola holds that:

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[436] "Action-at-a-Distance and Local Action in Gravitation," in *Pushing Gravity*, pp. 157-159.

- The CMB [CBR] radiation shows that ether exists all over the universe.
- The redshift shows that a Cosmic Background Gravitation in the form of gravitons also exists.
- Gravitons interact with baryonic matter (the atomic nucleus).
- Gravitation on a body is a pressure effect of gravitons flowing from the background space.
- The strength of the gravitons is equal to the gravitational constant *G*, and the force is measured by the inverse square law.

Halton Arp adds that gravitons are:

> …very low mass particles with a huge de Broglie wavelength compared to photons [and thus] have much less interaction with the intergalactic medium….The photon is transmitted through the average cosmic false vacuum, material vacuum or zero point energy field – to use just a few names given to the old fashion concept of 'ether.' But the graviton interacts with much less of this molasses and hence moves much faster.[437]

Reginald T. Cahill adds that interferometer experiments dating back to Miller in 1925 and the coaxial cable experiments up through DeWitte in 1991 show the presence of gravitational waves. These waves are said to be the proper interpretation of the periodic and non-random fluctuations in the same forces measured by the "Stanford University-NASA Gravity Probe B" satellite experiment that measured a geodetic precession and the Lense-Thirring 'frame-dragging.' Cahill concludes that the data shows "gravity may be…well represented in terms of a 'flow' system involving a velocity vector field…and this formalism is physically indistinguishable from the Newtonian formalism…"[438]

The Physical Cause of Gravity

How might this ether "flow" system work, mechanically speaking, to cause the effect of gravity? As we noted previously, the mechanism may actually be very simple. The ether has a granularity and concentration that is far finer and far denser, respectively, than ordinary matter. As such, ether will serve as the interstitial substance that fills the so-called "empty" space within the atom, as well as the space outside the atom. Since, however, the ether does not penetrate the atom's individual particles (protons, neutrons, etc), these atomic particles thus account for a percentage of the mass of the atom. But since the atomic particles are less dense than the ether, yet they occupy space in the atom, this means that the total density within the atom will be slightly less than the density of ether outside the atom. This imbalance will cause what can best be described as a partial vacuum in the ether, and the ether will seek to correct the vacuum by attempting to come to equilibrium. Here is the key: *The effort to correct the vacuum pressure is the cause of gravity*. The less-dense ether within the atom will seek to draw inward the denser ether that is outside the atom, and this force will continue until a balance is reached, but, in fact, a balance is never reached, and thus the force of gravity persists indefinitely.

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[437] "The Observational Impetus for Le Sage Gravity," in *Pushing Gravity*, p. 4.

[438] Reginald T. Cahill, "Novel Gravity Probe B Gravitational Wave Detection," Flinders University, Adelaide, Australia, August 21, 2004, p. 3. Various universities around the world have established Gravitational Wave Physics. The lab headed by Lee Samuel Finn and Benjamin Owen at Penn State University is one example.

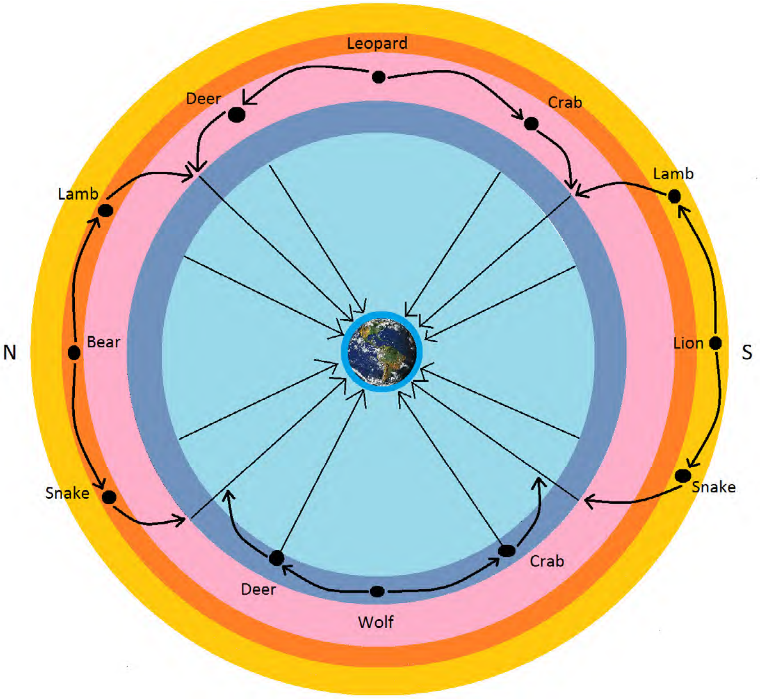
In Newton's case, for example, the apple falls to the Earth because the larger the mass, the stronger the vacuum pressure. The Earth, which is the larger mass, will create a stronger ether vacuum pressure than a smaller mass, and thus the smaller mass (the apple) will be drawn toward the larger mass by the force of the Earth's greater ether vacuum pressure. The reason the Earth creates a greater ether vacuum pressure than the apple is that the more atomic mass an object has, the less interstitial ether it will possess in its given volume, and thus the greater the imbalance it will have with the ether outside its mass. The Earth, having more mass than the apple, has less interstitial ether within its particular volume and thus a greater ether vacuum.

By the same principle, Jupiter will have more gravitational force than the Earth because Jupiter, having more atomic mass than Earth, will have less interstitial ether for its given volume, and thus create a greater ether vacuum, which then attempts to pull more forcefully the ether from outside the planet in order to reach equilibrium.

The Universal Winds from Points of the Zodiac

Hildegard explains a complex system of moving space throughout the universe. There are four main movements corresponding to the four compass points, but Hildegard usually refers to the Zodiac points to be even more specific (e.g., leopard, lion, wolf bear). The four main sectors each create four movements so that there are twelve in all. She writes:

Towards these four sides there appeared four heads: of a leopard, of a wolf, of a lion, and of a bear. Above the top of the figure, in the sphere of the pure ether, I saw the leopard's head expel, as it were, a blow from its mouth. The blow of its throat bent back somewhat at the right side, became elongated, and ran into the figure of a crab head with two claws, forming two feet, as it were. At the left side of its mouth its blowing, likewise bending backwards a little, ended in a deer's head.



Out of the crab's mouth, in turn, there came a breath, which advanced to the middle of the space which was located between the leopard and the lion's head. Out of the mouth of the deer's head there swelled a blow to the middle of the space between leopard and bear's head. All these blows were of equal length. The blow that extended from the right side of the leopard's head to the head of the crab, the blow that, on the left side of the same mouth, went to the head of the deer, just like the blow from the deer's head, which extended all the way to the middle of the space between the heads of the leopard and the lion. Finally, too, the blow came out of the mouth of the deer's head to the middle of the space between the heads of the leopard and the bear. All these heads breathed into the described wheel and towards the figure of the man.

Beneath the feet of the image of the man there came out, in the sphere of the watery air, a blow out of the mouth of the crab head with two claws. Out of this mouth, too, there came a blow as another wind to the wolf-lion-boundary. It, too, blew to the right to the middle of the space which was between the heads of the wolf and the bear. It ended in the figure of a deer's head, from where another wind moved to the wolf-bear-boundary. Corresponding to the gap between the heads, the winds also expanded, as this was already described with the leopard.

To the right, in the sign of the illuminated fire I saw a lion's throat blow from left to right. On the right, the wind turned into a snake, on the left in a lamb. The snake's head appeared in the center of the space which was located between the lion's head and the wolf's head, and expelled a breath. That breath expanded to the other half and merged with the blow which came from the crab's head, which was located between the head of the wolf and the lion. The lamb's head appeared in the center of the space between the lion's head and the leopard's head. Its breath expanded to the other half and ran towards the breath which came from the crab's head, which was located between the leopard's head and the lion's head. Corresponding to the spaces between the heads, the distances between the winds were also equal among each other. And their blowing was directed to the spherical wheel as well as the **human image** mentioned earlier.

To the left there appeared in the sign of the black fire a bear's head, out of whose mouth a wind blew to the right and to the left. To the right it ended in a lamb's head, to the left it took on the figure of a snake head. From the lamb's head a wind blew to the bear-leopard-boundary, from the snake head blew one to the bear-wolf-boundary. All winds were of equal length and were pointed to the human image across the universal sphere.[439]

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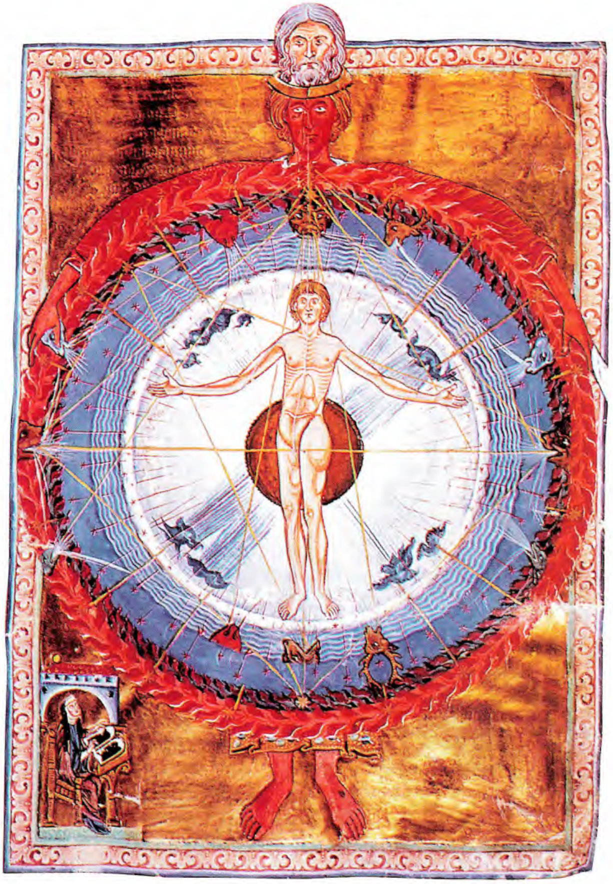
[439] *Welt und Mensch*, p. 36; *Das wahre Weltbild*, pp. 98-100.

> “Thereupon there appeared a wheel, wonderful to behold, on the breast of the aforementioned figure. In the middle of this wheel the figure of a man [human being] appeared. Towards the four directions there appeared four heads, in fact, so to speak, that of a leopard, of a wolf, of a lion, and of a bear. For above the figure’s vertex I saw, in the circle of the clear aether, the head of a leopard, which emitted a breath of air from its mouth. This breath curved itself at the right side of the mouth and formed into the head of a crab. However, at the left side of the mouth the breath terminated in the head of a deer. All these heads breathed onto the specified wheel and the human figure.”[440]



Hildegard’s vision of “The Human Figure” in the center of the cosmos

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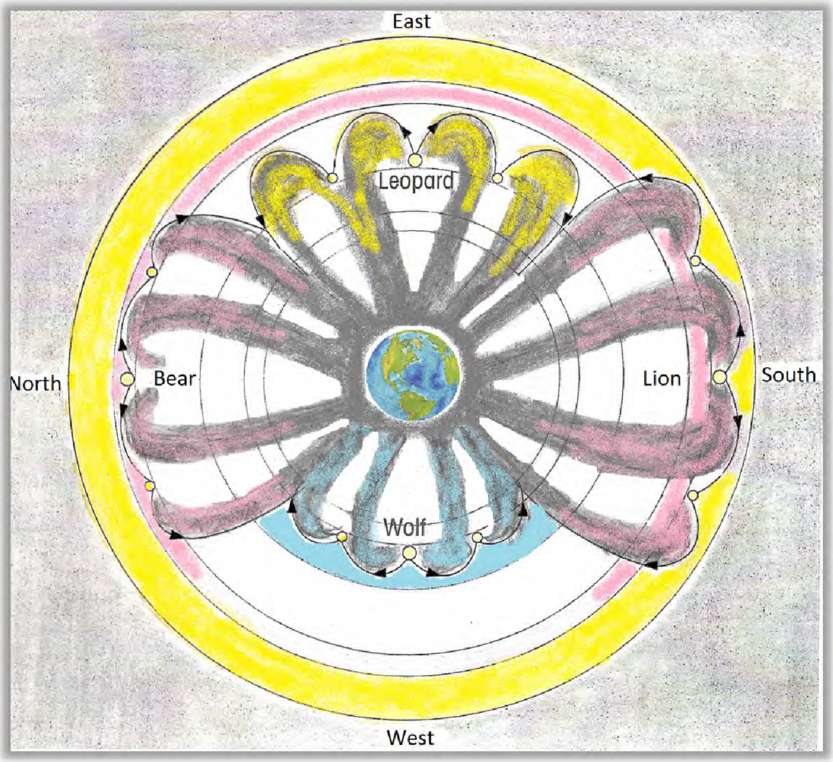
[440] *Die göttlichen Werke*, 441, *Das wahre Weltbild*, p. 111

The **twelve cosmic winds** and their points of origin are symmetrically and evenly divided around the perimeter of the universe. Essentially, the winds are arranged in such a way that they create a continual flow of pressure towards the center. We can imagine these as concentric spheres of cosmic ether waves moving toward the center at a constant speed, a sort of pressure wave. We can assume that it is in the form of millions of longitudinal waves hitting the Earth at every spherical square inch on its surface, thus keeping it from moving either translationally and rotationally.

The movement of the winds is somewhat complex. One set of winds begins outside the outer fire layer of the south side of the universe and blows laterally around the circumference and, after bouncing off the edge of the universe, curls inward toward the center of the universe where the Earth is located. Another set of winds begins at the north side of the universe in the inner fire layer and performs the same action as the south side winds. Another set of winds begins at the east side of the universe in the ether layer and performs the same action as the north and south winds. Finally, a fourth set of winds begins at the west side of the universe in the water layer and follows the same pattern as the other three winds.



Hildegard employed the names of animals both to distinguish each originating point (*i.e.*, south, north, east, or west) and to distinguish the separate winds within each origin point. Altogether, in Hildegard's vision, there are four main winds (which originate from the four compass points) and eight adjacent winds.[441] These twelve winds, symmetrically situated in space as if they were each at the hour position of a giant clock, produce cosmic waves distributed to the whole universe and which are directed, like spokes of a wheel, toward the center, where Earth is located. The pressure created by the twelve winds is distributed evenly at all points and consequently, as they reach the center, they are in mechanical equilibrium and thus hold the Earth in the exact center. These same winds, as they travel from the outer edge of the universe toward the Earth, create the phenomenon of gravity and inertia for every other celestial body in the universe. Consequently, any celestial body outside the Earth's immediate area will experience disproportional cosmic wind currents and thus move with respect to those currents.

Hildegard intimates that the winds originate both by the energy latent within each celestial layer (based on the principle that "fire" is included in each of the other three elements: air, water, and earth), yet the largest and primary cosmic wind begins in the layer of pure energy that is in the outer layer of the universe where also the universe's most massive stars are located.[442] In a fashion easily explainable in terms of modern science, the energy from the outer layer of the universe creates the inward gravitational pressure as it moves the particulate substance in space in symmetric wave motion towards the center of the universe. In this way, every object of the universe will experience gravity and inertia. Hildegard insists that there is neither movement nor force without these cosmic winds. Thus gravity is not a "curvature of space" and inertia is not an inherent property of motion, but both are the result of a well-designed universal machine working on the principle of mechanical cause and effect. Hildegard's vision of universal winds thus replaces the need for Dark Matter, for we can easily see that gravity is not dependent on the presence of matter; rather, it is a pressure force caused by the transfer of some type of electrical or plasma energy into a kinetic energy so that the cosmic winds can carry the waves of gravity and interact with the matter in a closed universe. It is possible that the high energy gamma-ray bursts or X-ray bursts found over the entire perimeter of the cosmos may be the peep holes by which we can verify the existence of this universal energy.

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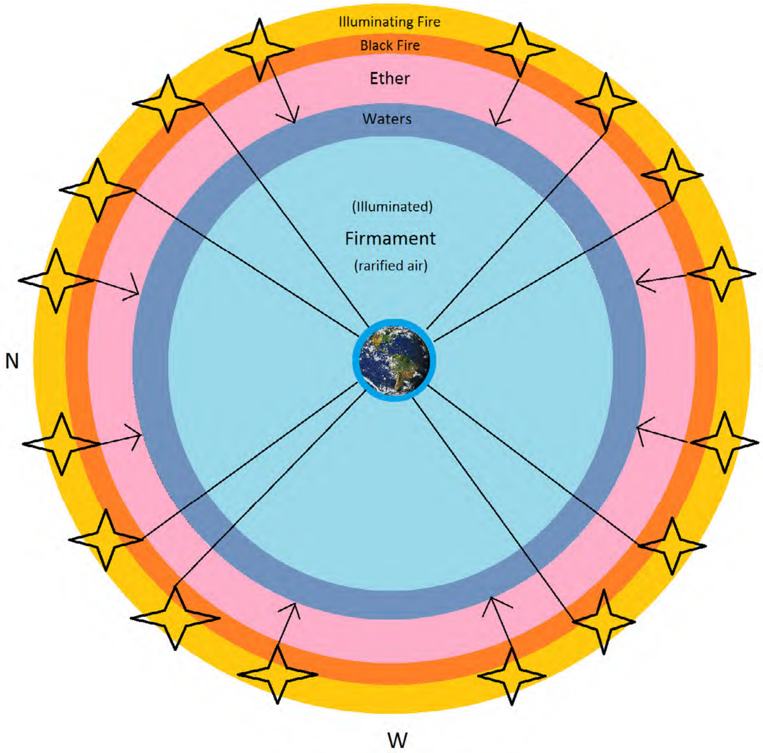
[441] *Welt und Mensch*, 36; *Das wahre Weltbild*, p. 100.

[442] In one instance, Hildegard attributes the origin to God himself, as she quotes what the man in the center of the universe said to her: "I am hidden in them as a fiery power. They blaze upwards out of me!" (*Die göttlichen Werke*, 42, *Das wahre Weltbild*, p. 101). This revelation thus makes an intimate connection between God and the universe, as suggested by Colossians 1:16-17: "for in him all things were created, in heaven and on Earth, visible and invisible, whether thrones or dominions or principalities or authorities – all things were created through him and for him. He is before all things, and in him all things hold together."

The Sixteen Controlling Stars

In conjunction with the cosmic winds, Hildegard's vision reveals **sixteen** of the most massive and powerful stars placed symmetrically at the perimeter of the outer fire layer of the universe. Four stars are positioned between a pair of compass points. Since they are evenly spaced from one another around the universe's circumference, their center of mass is the Earth itself and their energy is directed towards it like the spokes of a wheel.



Hildegard writes:

> In the zone of splendid fire you see the 16 main stars, because the biggest stars are situated at the outermost region of the celestial vault. Four between the leopard's and the lion's heads, four between the lion's and the wolf's heads, four between the wolf's and the bear's heads, and four between the bear's and the leopard's heads. That is: four stars between the east and south winds, four between the south and west winds, four between the south and north winds, four between the north and east winds dominate these sections and impact these winds. If they were more stars, they would overload] the celestial vault. Fewer would damageably weaken the vault. Since God preserves all created things from excessive abundance and unworthy shortage, it is always four each between two winds, because thus many are useful and necessary and not in their place unnecessarily. They are equally effective and stick to the firmament like nails on a wall. They never leave their place but rotate with the primordial vault, which they help to establish.
>
> From these the two in the middle between two heads each send our their rays to a point opposite of the weather zone, just as bony pockets go from a man's head down to his feet. As bony pockets strengthen a man's entire body, in like manner these stars strut the entire primordial vault and offer resistance to the adjacent winds so the winds do not move the firmament too much. They provide the cosmic air with the proper balance and are good neighbors to each other, because one helps the other carry the celestial vault. The other eight of both sides of the head direct their rays only to the zone of the black fire, because there they support their adjacent winds and offer resistance to the shadow fire so that it not send out excessive blazes of fire. These stars are all affixed to the firmament in equal distance from each other so that they preserve the primordial vault evenly and forcefully.
>
> You see that the circle of the pure ether and the circle of the bright clear air are full of stars, which send their twinkling to the clouds on the opposite side. They are not too many. With their fire they warm up the firmament and strengthen it. With their rays they penetrate the clear air all the way to the clouds under

> the strong, white, luminous air and stop the clouds, so that they stay within their God-given boundaries.[443]

Recapping, Hildegard says: "If there were more stars they would overload the celestial vault. Fewer would weaken and damage the vault….They are equally effective and adhere to the firmament like nails in a wall. They never leave their place but rotate with the primordial vault, which they help sustain."[444] The two outer stars from each compass quadrant radiate their tremendous energy towards the center (Earth), while the two inner stars in the quadrant (eight in all) radiate as far as the inner fire layer. All in all, Hildegard says:

> …these stars strut the entire primordial vault and offer resistance to the adjacent winds so that the winds do not move the firmament too much. They provide the cosmic air with the proper balance and are compatible with each other, because one helps the other carry the celestial vault.[445]

The purpose for the two inner stars radiating only to the inner fire layer is "that they support the adjacent winds and offer resistance to the fire so that it need not send out excessive blazes."

As for the billions of other stars in the cosmos, Hildegard states that they are evenly spaced throughout that "ether" layer and the "illuminated air" layer, and "warm up the firmament and strengthen it" (*viz*., the 2.73º Kelvin temperature). This would mean, then, that there are stars above and beneath the "water" layer, or what we commonly call "the waters above the firmament."

Modern science has confirmed the existence of massive stars in the universe. Already in the time of Albert Michelson in the 1920s, their existence was known and measured. Using the 100-inch Mount Wilson telescope, Michelson and Francis Pease were able to calibrate stars with linear diameters of 20 million miles (Arcturus); 30 million miles (Aldebaran); and 400 million miles (Antares). These figures haven't changed much from recent calibrations.[446] They also found that Betelgeuse, a variable, pulsating star, measures between 360 and 500 million miles in diameter. To get a grasp of how big these stars are, at its widest diameter, Betelguese would be twice as big as all of the spherical volume between the sun and the orbit of Mars. It is these types of stars, sixteen of them, that Hildegard says rule the universe's distribution of energy.

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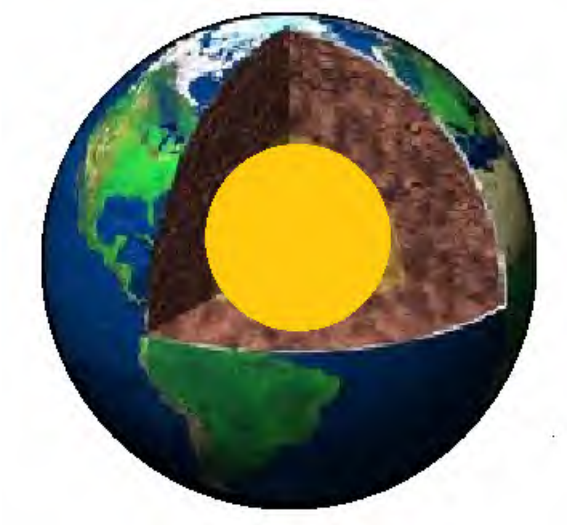
[443] *Die göttlichen Werke*, p. 111, *Das wahre Weltbild*, p. 102-103.

[444] *Die göttlichen Werke*, 111, *Das Weltbild*, p. 102.

[445] *Die göttlichen Werke*, 111, *Das Weltbild*, p. 102.

[446] Arcturus: 30 million; Aldebaran: 35 million; Antares: 410 million. Bernard Jaffe, *Michelson and the Speed of Light*, p. 159.

Of the Earth's inner structure, Hildegard says: "Half of the earth, that is, its upper layer, is delicate, soft, and able to be drilled through. The other half, however, that is, its core is tough, hard, and impenetrable. Its hardness and strength exceeds that of iron."[447] From this description we understand that the Earth has a dense core that is 4,000 miles in diameter, which is about five times that estimated by modern science.



The Effects of the Cosmos upon Earth

In Hildegard's cosmology all the heavenly bodies communicate with one another through the four elements of fire, air, water, or earth. Nothing is wasted or idle. For instance, Hildegard's visions show that the stars have a direct effect on the clouds in the Earth's atmosphere. She writes:

> With their rays they penetrate the clear air all the way to the clouds under the strong, white, luminous air and hold them so that they stay within their God-given boundaries.[448]

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[447] *Die göttlichen Werke*, 203, *Das Weltbild*, p. 109.

[448] *Die göttlichen Werke*, 111, *Das Weltbild*, pp. 102, 105.

Current science literature remarks on a similar cosmic-to-cloud exchange. In the 1990s, H. Svensmark of the Danish National Space Center found a connection between cosmic-ray intensity and cloudiness on Earth. Svensmark found that the influx of cosmic-ray muons created large numbers of sulphuric acid droplets, which then served as condensation nuclei for cloud formation. Writing about the phenomenon in *New Scientist*, Nigel Calder remarks:

> He [Svensmark] found that when the sun's activity was at its lowest, during which time about 25% more cosmic rays reach Earth, the planet was 3 per cent cloudier than during solar maxima.[449]

Hildegard continues:

> And this same air – the illuminated air over the atmospheric layer – also seems to carry the clouds a little higher, which are soon flying high and full of light, soon descending and dark. This spews out the watery air and gathers it back together, just as a smith's bellows brings forth a blow and draws it back in. Therefore certain stars, while put into the element of fire, then ascend in their circulation, drag the cloud upwards, whereby they too become illuminated. But when they descend in their circulation, they release the clouds again and thus they are dark and trigger downpours.[450]

This revelation explains a heretofore mysterious phenomenon (*i.e.*, how water, which is much heavier than air, can stay above air), but it is a solution that neither modern meteorology nor astrophysics has ever considered. According to Posch, Hildegard is describing a process whereby the electromagnetic impulses of the stars (which can act on the Earth's entire atmosphere instantaneously since they form a giant sphere of constant and inexhaustible power) act like an anode and cathode. The starlight ionizes the air, which, in turn, creates differentiated layers of gas. The gas layers, reacting to the flow of gravity, create changes in air pressure while also seeking to stabilize the total energy of the system. Hence, the cosmic pressure from gravity coupled with the reverse pressure created by the ionization of the atmosphere describes Hildegard's

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[449] Nigel Calder, "Cosmic Rays Before Seven, Clouds by Eleven," *New Scientist*, Oct. 10, 2006, p. 13

[450] *Die göttlichen Werke*, 66, *Das wahre Weltbild*, p. 105.

"bellowing" effect, which we experience as high- and low-pressure pockets throughout the Earth. The whole process results in a continual regeneration of the atmosphere. One of the effects of such atmospheric purification is the production of soft rainwater through a type of distillation process, a distillation that is initiated by the immense energy of starlight from billions of stars.

Moreover, a similar process of gas exchange occurs throughout the universe and is one of the reasons that the temperature can remain at precisely 2.73° Kelvin. Such a process would require the existence of massive amounts of water in space similar to the way water exists in the Earth's atmosphere. Indeed, our earlier citations of the scientific evidence show that such amounts of water exist not only in space but also in the stars themselves.

Regarding electrical processes playing some part in the attraction and repulsion of cosmic entities, as early as 1830, Ottavio F. Mossotti, a French physics teacher at the University of Buenos Aires, postulated that attractive force was caused due to the very slight excess of attractive forces between electrical particles as opposed to the particles' force of repulsion. Since matter is understood to contain positive and negative electricity, obviously, if the attractive forces between particles of opposite electrical charge exceed the repulsive forces of the like particles, an attraction would result.[451] Since electrical forces are so much stronger than what we experience as gravitational force, it would only require a slight residue of attractive electrical force to produce the forces we experience in the cosmos. This would require that Coulomb's law, which holds that two repulsions and two attractions cancel each other, could be slightly weighted to one side or the other. Of note, AmpΠre had shown that another motion is produced between electrical charges that are not described by Coulomb's law. Wilhelm Weber added that attraction also depends on the velocities and accelerations of the bodies in view, whereas Coulomb's law applies to bodies at rest.[452] In any case, Weber seriously considered Mossotti's hypothesis, publishing a paper on the relationship between electricity and gravitation which relates the difficulty in testing whether there is, indeed, a slight difference between attractive and repulsive forces.[453]

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[451] O. F. Mossotti, "On the Forces which Regulate the Internal Constitution of Bodies," 1830.

[452] Wilhelm Weber, "Elektrodynamische Maasbestim-mungen: Über ein allgemeines Grundgesetz der elektrischen Wirkung," Werke, Berlin: Julius Springer, 1893, pp. 25-215. Cited in *21st Century Science* by Laurence Hecht, Spring 2001.

[453] *Ibid.*, pp. 479-525.

Following Weber, Walter Ritz also questioned the electrodynamics of Maxwell and Lorentz, and attempted to revive the abandoned approach of Gauss and Weber. He postulated that the result of the electrical forces between two bodies would be attractive. His reasoning was not based on Mossotti's theory, however. Ritz based his on the internal motions of the electrical particles in the atoms. Having died prematurely, Ritz had no opportunity to develop his idea. Current Plasma cosmology is just now delving into these areas of research and much has been written on what has come to be known as the "electric universe."[454]

Energy Supplied to the Sun

Interestingly enough, plasma cosmology holds that the energy from the sun and stars that creates heat and light does not originate from a process of nuclear fusion within the cores; rather, it originates from the energy given to the star from external electrical forces in the cosmos which are then distributed on the surface of the star. Hildegard's visions portray something very similar, at least for our sun. Her visions reveal that in order for the sun to remain aglow, it must always be supplied with the cosmic air current. As we have already noted, the air current originates in the outer layers of the universe, yet Hildegard adds that the planets themselves help radiate the air current toward the sun. Mars, Jupiter and Saturn work as a three-blade fan circulating the rarified cosmic air. As Hildegard says:

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[454] As plasma physicist Eric Lerner suggests in his book *The Big Bang Never Happened*, Vintage Books, 1992; also Erwin Saxl, "An Electrically Charged Torque Pendulum," *Nature*, v. 203, pp. 136-138 (1964). C. F. Brush discovered anomalies between mass and gravity in certain materials, and concluded: "the ratio of mass to weight is not the same for all kinds of matter, as has been supposed, and the mass-weight ratio is not constant even in the same kind of matter" (*Physical Review*, vol 31, p 1113(A); Vol 32, p 633 abstract. Proc. Amer. Philosophical Soc. Vol IX No. 2, 1921; Vol LXVII No. 2, 1928; Vol LXVIII No. 1, 1929. *Journal of the Franklin Institute*, Vol. 206, No. 1, 1928). The *Biefield-Brown Effect*, as found by Thomas Townsend Brown in the late 1920's, produced a slight weight change in a specially constructed capacitor when it was subjected to an extremely high DC voltage. Others have verified the effect and several patents have been granted over the years, but no one has been able to explain what the effect is or its source. Roger Brown, in *The Biefield-Brown Effect Revisited* (1996), offers an explanation to the origin of the force. Many others have written on this topic, but theories postulating that electrical forces cause gravity contradict the tenets of General Relativity, and therefore such papers are usually shunned by the major physics periodicals.

> And there are only three, for if they were more, they would ignite the fire too much and disturb it through their orbits. Or if they were fewer, the fire would become cold in its blaze."[455]
>
> The planets enable the sun. Without them, the sun could not exist. They add warmth to it….The planets move from west to east counter to the firmament. Thereby they restrain the fire of the sun with their fire and, on the other hand, renew it for the great kindling. If they did not run counter to the firmament and hurry towards the sun from behind, the sun would not be renewed but freeze into solidity….That's why the planets have effectively been put in the firmament by the Creator of the world in this manner.[456]
>
> The first planet (Saturn) uses its radiance to lighten the radiance of the sun.
>
> The second one (Jupiter) uses its blaze to serve the blaze of the sun.
>
> But the third one (Mars) with its orbit attempts to keep the orbit of the sun on its straight course.
>
> The sun is surrounded, guided, and held tight by these three. In this respect it is to give to the firmament and the whole world the right mixture of its warmth and radiance.[457]
>
> The sun would scorch the earth if the moon did not offer resistance, because the moon tempers the sun's blaze by means of its cold moisture. That's why the sun and moon, by divine ordinance, serve man in this manner, bringing him health or infirmity, according to the mixture of air and air flow. That's how it was revealed.[458]

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[455] *Die göttlichen Werke*, 92. *Das wahre Weltbild*, p. 133.

[456] *Die göttlichen Werke*, 101. *Das wahre Weltbild*, p. 134. Posch notes: "Accordingly, it is manifestly known that the periodic activity of the sun is linked to the orbits of the planets. The fluctuating number of sun spots was discovered by Samuel Schwabe the previous century. They can become so big that sometimes at sunrise one can see them with the naked eye. Emerging in a period of about 11 years, the sun spots indicate a cooling of the sun's surface" (*ibid*).

[457] *Die göttlichen Werke*, 93; *Das wahre Weltbild*, p. 132.

[458] *Berliner Fragmente*, 30; *Das wahre Weltbild*, p. 136.

Mathematical Constants in the Geosystem

As we have noted, although we commonly accept that the sun rises in the east and sets in the west, in actuality the firmament is rotating east to west (or clockwise for someone standing at the North Pole) and it is carrying the sun. At the same time, the sun is making a very slow counter-clockwise movement, from west to east, against the firmament. Analogously, we might say the sun is moving slowly upstream like a salmon. As it moves against the current, the sun takes 27.2753 days to make a complete counter-revolution within the firmament, based on sidereal time and position.

While the sun is orbiting the Earth, so is the moon, and in almost the same way and in the same time. As the firmament moves clockwise (from east to west) it carries the moon, and thus the moon appears to rise in the east and set in the west, just like the sun. Its time between rising and setting is almost identical to the sun's, except that it needs an extra 0.0447 days to make its revolution around the Earth, based again, on sidereal time and position. In all, the moon takes 27.32 days to complete one revolution around the Earth. (Keep in mind, however, that compared to the background of the stars, both the sun and the moon are slowly moving west to east on a daily basis).

That the sun and the moon have an almost identical time of revolution around the Earth is no mere coincidence. Since each revolves in about 27 days, there is a one-to-one ratio. This ratio is needed to establish the balance in the universe's movements. Any faster or slower and the movement would be out of kilter, namely, the balance between what Newtonian physics understands as the centrifugal and centripetal forces, but also other important forces, such as the gravitational constant, the angular momentum of subatomic particles, and most if not all of the other fundamental constants we have noted previously.

According to Posch, the precise number 27.32 becomes very important in cosmological mechanics. Basing the rotation of the firmament on a 366-day-per-year cycle, there are certain fixed ratios that naturally develop. That is, 1 year divided by 366 days equals 0.002732 years; and 1 year divided by 27.32 days equals .03660 years. For the first value, we can say that 1 day equals 0.002732 years, or that the firmament rotates 360° every 0.002732 years. Other uses appear in, for example, the acceleration of the moon as it orbits the Earth at 0.273 cm/sec^2, and the moon's radius being 0.272 of Earth's radius, which shows that there exists an intimate mechanical connection between the Earth and the moon. Perhaps

Hildegard's statement that the moon's orbit around the Earth is the basis "by which everything else is reckoned" can now be better understood.[459]

No Ellipses for the Solar Movements

Another interesting facet of Hildegard's universe is that the path the sun traces out as it orbits the Earth is not an ellipse. In keeping with the Aristotelian model, the sun moves in a circle. As Hildegard describes it:

> The other planet moves counter to it and drags the sun upwards to the constellation of Aries….These propel the sun forward with great force [acceleration]….The two planets accompany the sun for a while so that it won't move downwards too fast. [At Virgo] the sun moves more slowly on its path [deceleration].[460]

Actually, in the relationship of the sun to the Earth, a non-elliptical path is not critically significant. Although in heliocentric illustrations the ellipsis of the Earth's path around the sun is often exaggerated for effect, in actuality it is very close to a perfect circle, with only a 3% variance. Still, there is a slight difference which would accumulate over time and thus a precise understanding of these movements is necessary to know.

We noted earlier in comparing Kepler's solar system against Copernicus' that, whereas Copernicus sought to keep the perfect circles of Aristotle and Ptolemy, this system did not work properly, forcing Copernicus to include 48 epicycles to his planetary movements. Seeing these flaws, Kepler found that the data of planetary movement (which he obtained from Tycho Brahe) fit much better when the orbits of the planets around the sun were elliptical, some of the planets having a sharper ellipse than others. In that comparison, we also noted that an elliptical path is equivalent to a circular path if the speeds of the orbits are adjusted. Hence, as long as Hildegard's geocentric model can account for these differences, her system is equivalent to the Keplerian elliptical system. This is not to say that the Keplerian system is the standard by which all other systems are judged (for we have seen that even the Keplerian solar system has its difficulties), but only to say that Hildegard's model explains the motions of the sun and planets in circular orbits just as well as the best heliocentric model explains elliptical orbits.

What makes the planets travel faster in one part of their orbit and slower in another? As Posch puts it:

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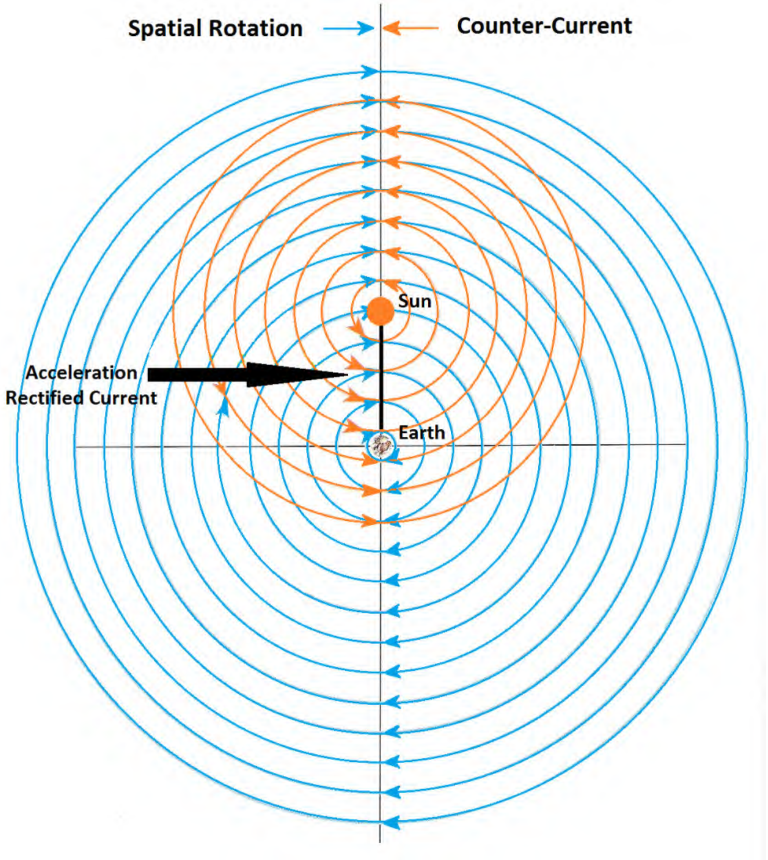
[459] *Das wahre Weltbild*, p. 123.

[460] *Das wahre Weltbild*, p. 143.

The reason is that the center of mass (or center of gravity) of the cyclical counter-rotation lies nar the sun's mass, whereas its point of rotation is the Earth. For the spatial rotation, the north-south axis of the Earth forms the central point of rotation, whereas the counter-current intersects the north-south axis in the center of the Earth at an angle of 23.5º (the ecliptic). Thereby emerges a rectified current between the Earth and the sun, which results in an acceleration, of course, whereas the direction of rotation over and above that is counter-rotation. This also explains why the distance Earth-sun (1AU) is so significant mathematically. The sun obeys the laws of the gyroscope. Its torque causes the precessional movement.[461]



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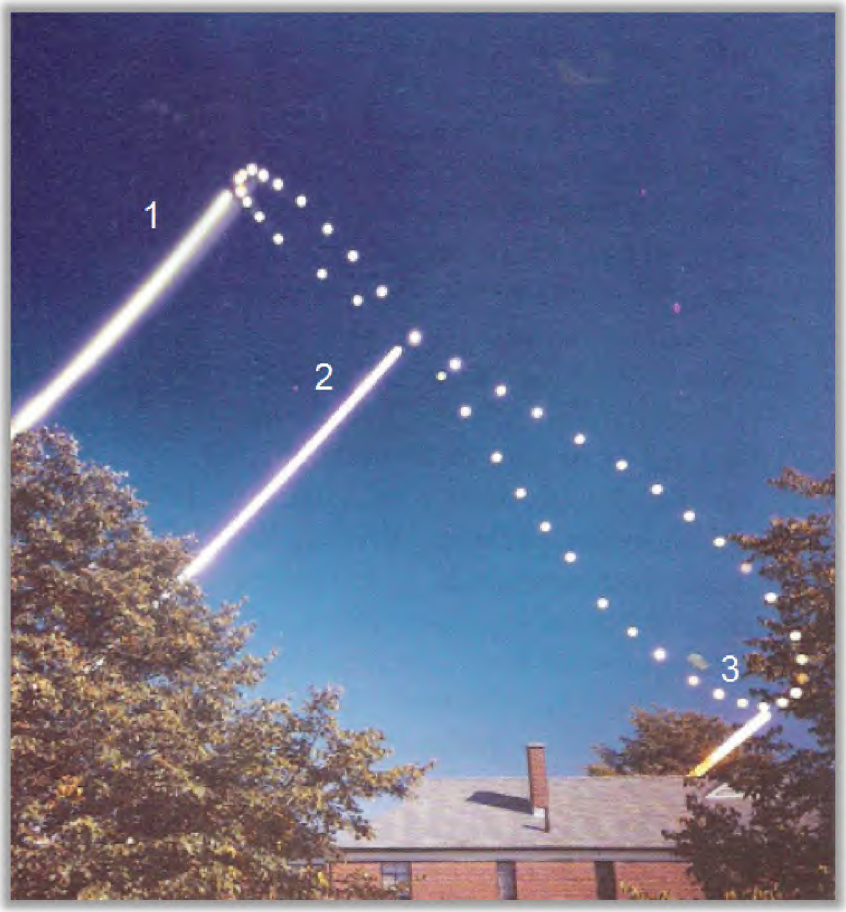
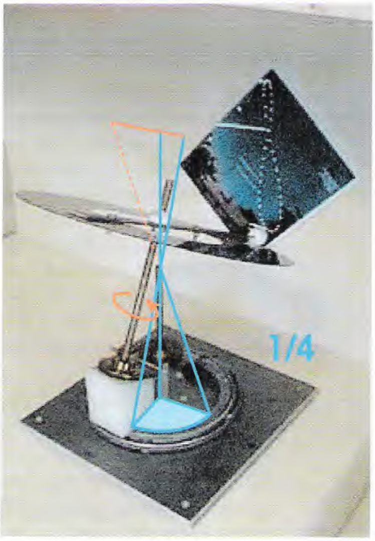
[461] *Das wahre Weltbild*, p. 151.

The Significance of the Analemma

As the sun moves in its orbit over the course of a year it forms an **Analemma**. By photographing the sun at the same time each day for an entire year and assembling the photos so that they show the progressive movement of the sun, a figure-8 pattern is revealed. In addition, the lower loop of the figure-8 is longer and covers more area than the upper loop. The first composite photograph of this phenomenon was produced by Dennis Di Cicco and published in *Sky and Telescope* in 1979. In the heliocentric system the Analemma's asymmetry is explained by the Earth's tilt of 23.45° in addition to the ellipses it forms as it travels around the sun. In the Hildegardian geocentric system it is explained by the precessional movement of the sun in addition to its acceleration and deceleration at specific points in its orbit.





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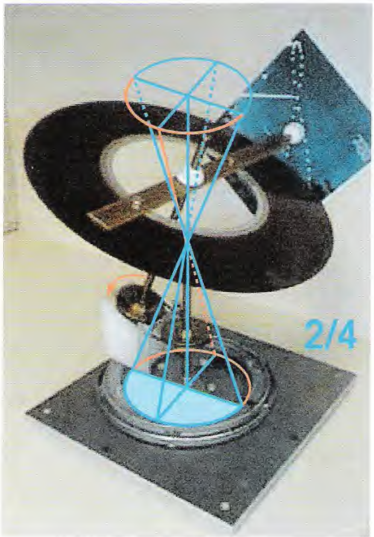

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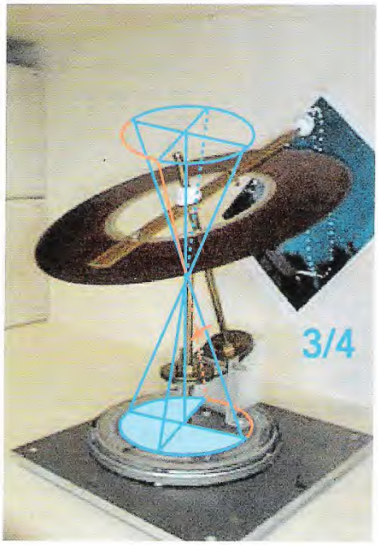
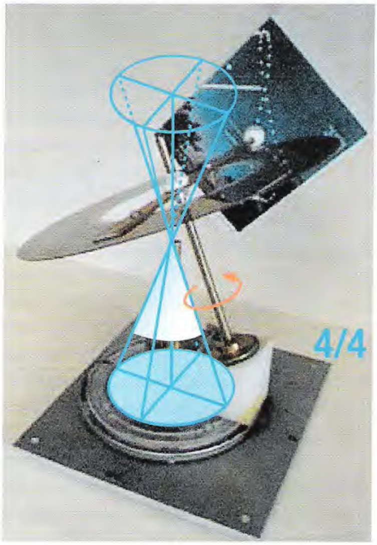


Summer



Autumn

As Posch discovered, these two independent movements of the sun follow the principle of the Cardanic function. As one text stated:

> A mechanism that is particularly useful, surprisingly, is the cardanic joint, which is well-known in other applications. Its

> precision is based on a caprice of nature. Moreover, it is certainly an interesting coincidence that certain basic relations of celestial mechanics describe the same functional relations as the movement of the universal joint or cardan joint. The effect of the cardan is understood in the following relation: Tangent B = Cosine N × Tangent A, where A = angle at the drive; B = angle at the output; and N = slope between A and B. The exact same function describes the relation between the eccentric and the true anomaly….Further, the relation between the center of the ellipse and the eccentric anomaly is, in turn, the Cardanic function.[462]

The "caprice of nature" to which the author refers is that, although the drive of a universal joint is uniform, the output is asymmetrical. This causes the mechanism to wobble or create a precession. This is why all rotating shafts that use a universal joint will vibrate, and it is the same reason why a gyroscope will wobble around its center of mass when it is hit by an external force. In essence, an elliptical orbit in which the sun or a planet accelerates or decelerates in keeping with Kepler's law of areas is equivalent to the same principle that governs Cardanic movement. The question is: which system is correct? If the sun and planets travel in circular orbits although at asymmetric velocities, and by doing so match Kepler's elliptical orbits, then there is nothing in the mathematics that can deny it as a viable order of celestial movement. In fact, Kepler knew that the sun moved faster through the stars at various times of the year. As Einstein notes of Kepler:

> To begin with it followed from observations of the sun that the apparent path of the sun against the background of the fixed stars differed in speed at different times of the year…[463]

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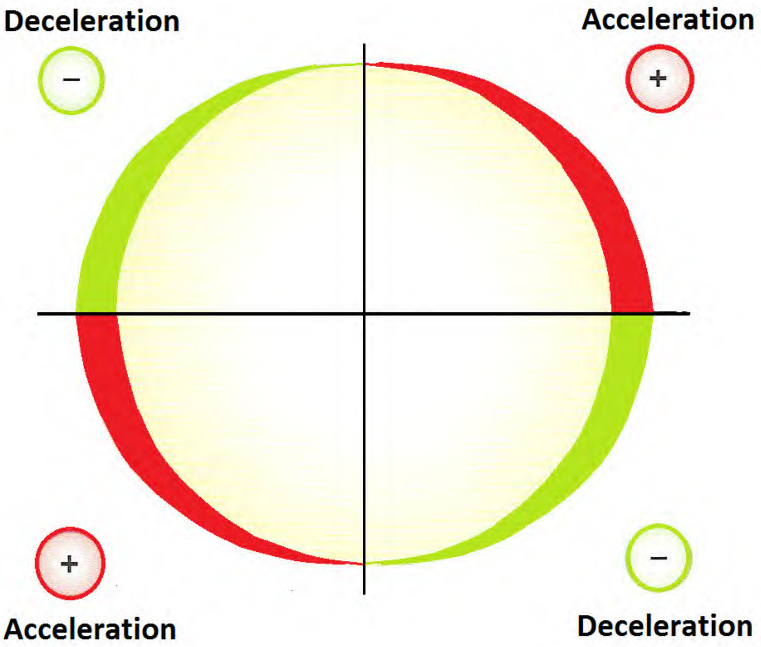
[462] Quoted from *Der Himmel auf Erden*, Meier, cited in *Das wahre Weltbild*, p. 145. In orbital motion, an elliptical orbit is understood as the product of three elements: (1) the semi-major axis, which gives the size of the orbit; (2) the eccentricity, which gives the shape of the orbit (between 0 for a circle and 1 for an infinite parabola); and (3) the mean anomaly, which is an angle growing at a steady rate up to 360° for each orbit. The actual position, however, is given by the *true anomaly*, which is given in polar coordinates.

[463] On the occasion of the three hundredth anniversary of Kepler's death. Published in the Frankfurter Zeitung, Germany, November 9, 1930, Albert Einstein, *Ideas and Opinions*, New York, Crown Publishers, 1954, Wing Books, 1984, p. 263.

This is quite significant, since if Kepler understands the stars as fixed in space, then the sun's acceleration and deceleration against such a fixed background means that the sun is producing an absolute movement. In any case, whereas Kepler's model is quite complicated, Hildegard's model can be represented by a simple **sine curve** in which the acceleration and deceleration of the sun represents the positive and negative curves on the *x*-axis of the graph.


Deceleration
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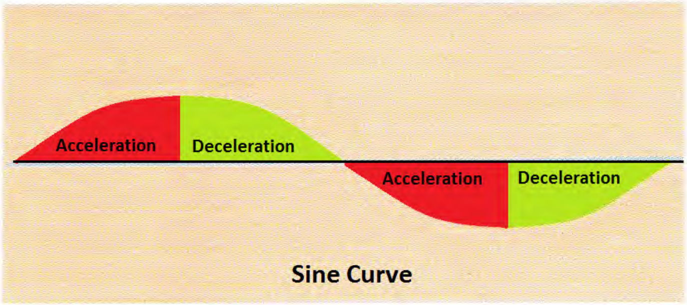
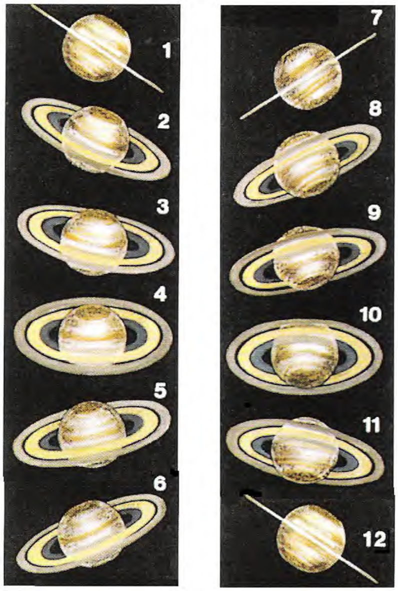
Deceleration

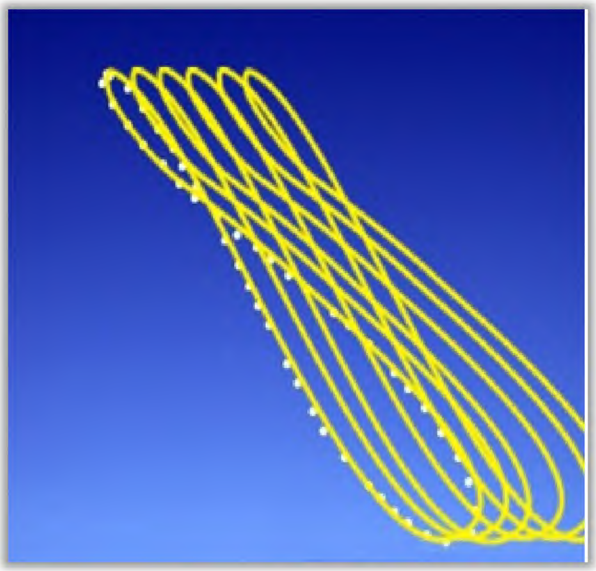

Acceleration
Deceleration
Acceleration
Deceleration
Sine Curve

Yet there is another ingredient to this phenomenon. As we noted above, the Analemma shows that the sun travels farther in the lower loop of the figure-eight than it does at the top loop. There are two reasons why this is so. The first is that the sun is traveling on the ecliptic plane that is oscillating side-to-side over a span of 47 degrees in the course of one year. But it is not only oscillating with a side-to-side motion but with a circular motion, just like the plane of a spinning gyroscope that starts out with a 23.5° tilt (provided we keep the gyroscope spinning). To get a good mental picture of how this occurs, one can view the planet Saturn over the course of its orbit around the sun. Saturn's rings will represent the plane of the ecliptic while Saturn itself represents the Earth. Over the course of its 29.5-year orbit, Saturn's equatorial plane will oscillate side-to-side 54 degrees, or 27 degrees above and beneath its center of mass. As it does so the plane will also precess, which will appear in telescope photographs showing the rings moving front-to-back as well as side-to-side, just as in gyroscopic motion. If one were to attach a long pencil to the rings and have it draw on a background behind Saturn, one would see the characteristic Analemma.



The Analemmas, however, are made without the ellipses of the Keplerian system. The reason is that the sun will orbit the Earth in an asynchronous manner, accelerating and decelerating at periodic points in the orbit. In all, there are two accelerations and two decelerations, evenly divided over the orbit. Using the face of a clock to create the image, from 12-3 the sun is accelerating; from 3-6 it is decelerating; from 6-9 it is accelerating; and from 9-12 it is decelerating, following the typical sine curve. As the sun makes these varying movements in gyroscopic fashion, the Cardanic function will produce the characteristic elongated lower loop of the Analemma.

In addition to the sun's annual precession, there is another precession that it creates, although this one is over the course of 26,000 years. As we noted earlier, the sun is revolving daily with the rest of the universe in a clockwise direction around the Earth each day. But the sun is also moving in a counter-clockwise motion against the clockwise motion of the universe. Because of the sun's asymmetrical gyration in its orbit, it will cause the orbit to advance 50 arc seconds beyond the starting point of the annual revolution, and this will cause the sun's orbit to precess ever so slightly against the uniformly rotating universe. Over the course of 26,000 years, the sun will come back to the beginning of its precession cycle. Whereas the heliocentric system attributes the 26,000-year cycle to the precessional movement of the Earth's axis, which is said to be generated by the bulge in the Earth's equatorial plane (even though satellite photographs of the Earth do not show an equatorial bulge), geocentric cosmology attributes this precession to a miniscule time difference in the movement of the sun against the firmament. Consequently, this 26,000-year precession will cause the **Analemma to shift** to the east each year by 50 arc seconds against the background of the stars.



The next issue to be investigated concerns the force that is causing the sun and the planets to accelerate and decelerate at precise periodic points in their orbits. Before we answer this question, we should note that the same question should be asked of those who advocate the Keplerian model of ellipses, that is, according to Kepler's second law, what, precisely, causes the planets to trace out equal areas in the same time period? A Keplerian would answer this challenge by appealing to the "force of gravity" and the "force of momentum," showing us by mathematical equations how these two principles work in tandem. But in reality these mathematical equations neither tell us what moves the planet in its designated orbit, nor the cause of gravity or momentum. The equations merely measure the respective forces. Moreover, in not knowing the cause of the forces, the Keplerian cannot even be sure that the orbits of the planets are ellipses. The ellipse is merely his most convenient mathematical model, but it is certainly not the only possible model. Hildegard's system is very unique because she tells us the physical cause of every movement in the system, and it is then our job to apply the mathematics to what we know is the reality, rather than, as Kepler did, create a mathematics for something he did not know was the reality.

We noted previously that in Hildegard's system the planets are propelled around the sun through a system of cosmic eddy currents, which have varying strengths depending on the planet in view. Now we will add a second dimension to the movement of these currents. The currents will periodically accelerate or decelerate because, as Posch says, "the center of gravity of the cyclonic counter-rotation lies in the solar mass, whereas its point of rotation is the Earth."[464] He further explains that the rotation of the universe is centered on the north-south axis of the Earth, but that the counter-rotation of the sun intersects the north-south axis at an angle of 23.5 degrees. This creates a "rectified current" between the sun and the Earth, which results in an acceleration of the sun, and likewise for the inner planets as opposed to the outer planets. Since there are two opposing currents: (a) the current causing the universe to rotate around the Earth, and (b) the current causing the sun to move against the rotation of the universe; and since these currents pivot off a fixed Earth, there will arise differences in current pressure that will cause periodic acceleration of anything outside the Earth. Calculating the rate of acceleration is rather simple. Using the sine curve we can determine the measure by which any planet will deviate from uniform speed.[465]

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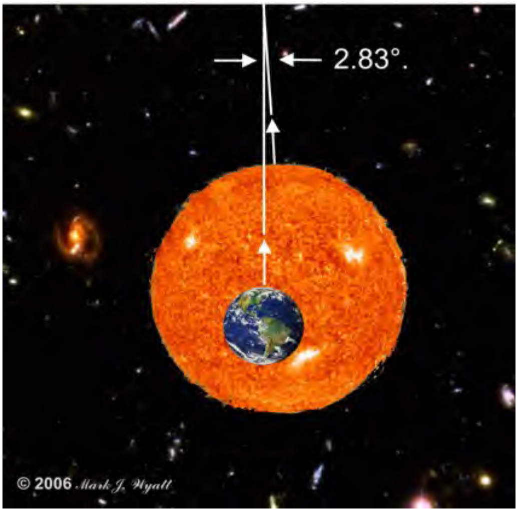
[464] *Das wahre Weltbild*, p. 149. His German reads: "Der Grund liegt darin, weil der Schwerpunkt der zyklonförmigen Gegendrehung in der Sonnenmasse liegt, während ihr Drehpunkt die Erde ist."



Another factor in these movements is the tilt of the sun. According to Posch's calculations, the sun is at a constant **axial tilt of 2.83°** eastern longitude vis-à-vis the vertical of the ecliptic plane. (In the Copernican theory the sun is tilted at 7.25° but this value does not make any appreciable difference in the movement of the planets). On January 5, as it would be viewed from Earth, the sun's axis is perpendicular to its equator and it has the lowest speed in its orbit. Normally we would think that these changes would begin to occur at the winter solstice on December 21-22, but because of the sun's axial tilt, it is the case that the gyroscopic effect, which in turn produces its angular momentum, gives the sun about an extra two weeks before it reaches its lowest ebb. Once it reaches the lowest speed on January 5, it will immediately begin to accelerate. This acceleration will last until about March 6, and then it will begin to decelerate until about July 7. At this point the sun's axis is once again perpendicular to its equator (as it was on January 5), but this time the axis is tilted 2.83° toward Earth instead of away from it. On July 7 the sun will again accelerate until September 8 and then decelerate until January 5. Incidentally, these fluctuations in speed of the sun in Hildegard's system would equate to the eccentricity of the Earth's orbit in the Copernican system. Quoting Posch's calculations in detail, we read:

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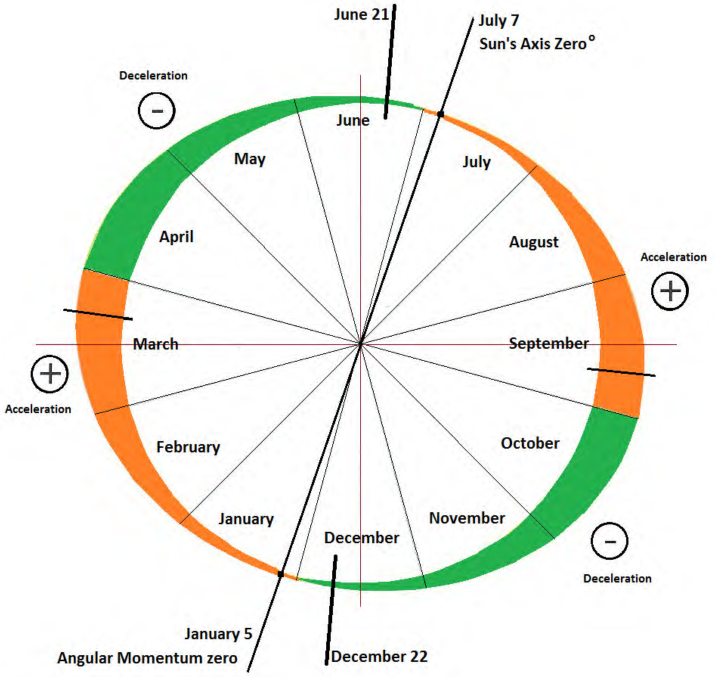
[465] Posch adds that in changing from an elliptical to a sinusoidal acceleration, one must include the necessary conversion factors. Putting the data in dBASE4, he gives the parameters as: $k = 360/365.2422$ = constant angular speed of the sun; $n = 1$ = trip meter (in loop per day + 1); exz = eccentricity (starting with a zero value on January 5th); x1 = D to R ($n \times k$) = average daily increase in radian measure where D to R is degrees to radiant. The resulting equation is: y = D to R (exz) × sin (x1) × $180/\pi$.

> The acceleration of the sun starts, in each case, after the winter solstice around January 5th and after the summer solstice around July 7 and lasts a quarter of a year each time. The angular momentum, accordingly, amounts to 2/4. Canceled down, this corresponds to the well-known value ½, *i.e.*, 0.5. If we calculate using an angular momentum of ½, we get a yearly period. But if we are more correct and make it 2/4, as it corresponds to reality, then we get the desired semi-annual period. To make it easier, we simply cut the circle (360º) and the circular number (π) in half, whereby we receive the appropriate value of the periodic acceleration (in the Copernican system = eccentricity); Exz = eccentricity • 180/ (π / 2).[466]


June 21
July 7
Sun's Axis Zero°
Deceleration
−
June
May
July
April
August
Acceleration
+
March
September
+
Acceleration
February
October
January
November
December
−
Deceleration
January 5
Angular Momentum zero
December 22

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[466] *Das Wahre Weltbild*, p. 153.

Because the new method yields the acceleration factor (xl) from the daily increase (days × 0.98°), there follows from it the conversion of the elliptical eccentricity (exz) from the residual of the central equation (c) in a daily fraction. To obtain exact values for our starting position (earth/sun), we need to consider the residual speed of the 'run-down phase' as residual acceleration.

Only in this manner are the digits after the decimal point of the beginning value sufficiently exact. Thus, the formula for our docking maneuver must be:

$$\text{Daily increase } x1 = n \times 0.985647$$
$$\text{Acceleration } y = exz \times \sin(x1)$$
$$\text{Daily fraction } n = (c/exz) / 0.985467$$

The n-value contains the daily fraction. Thus we are able to continue calculating seamlessly on a Hildegardian basis with +1 for each following day. The result is astonishingly precise. Of course the ecliptical coordinates still need to be converted to the hourly circle, and the nutation and aberration still need to be factored in. The numbers agree almost exactly to the second with the official astronomical specifications of the celestial yearbook.[467]

The basis of calculation is a precessional computation that progresses purely mechanically, without including the nutation or aberration.

I took the *true length* of the sun on December 25th as the starting position. The daily value is sufficient for a first approximation. For an exact calculation, it would also be necessary here to determine [ascertain] the daily fraction at the time of the passage of the meridian (if equation of time = 0.000…). All the rest is obtained by the trigonometric functions of the x and y axes, as the formula in the box shows.

Thereby I have proven once more that celestial mechanics is indeed derivable from two counter-rotating circular movements! This process further supplies us with an important indication for the accuracy of the Hildegardian worldview. Why? Because the periodic acceleration phases of the sun begin at exactly the point in time after which its axis passes the zero point. They begin several days after the winter solstice, around January 5th each time, and several days after the summer solstice, around July 7. On these two days, the additional

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[467] *Das Wahre Weltbild*, p. 154.

- angular momentum = zero
- position of the axis = zero

The phase shift of the angular momentum at the winter and summer solstice results from the constant inclination of the sun's axis of about 2.83 degrees.

In this manner the Creator solved the overcoming of the dead point at the turning point in an elegant way. He slightly displaced the sun's axis from the vertical position, whereby the axis lags behind. This leads to its angular momentum not yet having reached the zero value when arriving at its turning point. Thereby the sun overcomes the turning point with its remaining speed without much effort.

If the sun's axis stood exactly perpendicular to the ecliptic, its angular momentum at the turning point would be zero, and to overcome the dead point additional energy would be necessary. This energy would be supplied at the expense of the sun's orbital speed, which is not, however, according to the mind of the Creator.

A logical corollary of the sun's circular movement is its constant distance to the Earth, of course. If the theoretical solar diameter is produced in celestial yearbooks because people are calculating using Kepler's laws, then one can confidently discard these numbers. The sun always has the same diameter because its distance to the Earth is constant throughout the entire year.

1) dm = DtoR (2.83) true inclination of the sun's axis (in radian measure).
2) b = DtoR (n × k-beg) number of days × 0.98 degrees: true length Dec. 25.
3) es = obliquity of the ecliptic.
4) soX = ATAN (cos(b) × tan(es)) × 180/π is the ecliptical precessional motion.

> 5) soY = ATAN (cos(b) × tan(dm)) × $180/\pi$ is the rotational axis of the sun.
> 6) soZ = round (soX + soY,1) are the X + Y = position angle of the sun.[468]

Posch then cites a source showing corroboration with his findings.

> One year after my mathematical studies I read in Raum & Zeit Spezial 7 [Space & Time Special 7] a discourse about calculating planetary orbits. Therein the mathematician J. Huber proves that the revolutions of the planets can also be interpreted as a vortex. The entire study appeared in *Mathematische Physikalische Korrespondenz* (no. 144, Institut Dr. Unger, CH-4149 Dornach). We confine ourselves only to the conclusions of the mathematical results, which lead to the following statements:
>
> It is obvious that Einstein's field theory of planetary orbits leads to the same results as Newton's mass theory…that is, the acceleration of gravity is equated with a centripetal acceleration of an orbit. The planetary system, in its action, is comparable to a huge vortex, whose center is located in the central body. Presupposing stable relations, imagine this vortex as divided into individual concentric stream tubes.
>
> If we now keep in mind that the speed of light *c*, according to $gM = c^2r$, increases as the radius decreases, we can imagine, according to the Bernoulli equation:
>
> $$c^{2/2} + p/p = \text{constant}$$
>
> that, in the same sense, the inner pressure in the stream tubes decreases vis-à-vis the center. This pressure gradient, which points from the inside to the outside, effects a centripetal force on a planet, which corresponds to gravitational force.
>
> It may be interesting in addition to envision the relations of a solid-state vortex, *e.g.*, a rotating disc. Also imagine this vortex to be divided into individual circular discs and take into account that here the speed *c* with an increasing radius remains a pressure

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[468] *Das Wahre Weltbild*, p. 156.

gradient to the outside. As is generally known, this [speed] results in centrifugal forces, which affect every voxel of the disc.

Wherever the centripetal speed gradient of the planetary vortex is locally disturbed through a con-glomeration of matter, *e.g.*, in the form of the planet, a centrifugal force joins the centripetal one, and the stationary orbit of the planet is marked by the fact that the effect of both forces keep the equilibrium for each revolution. This result suggests that gravity should be looked at as an effect of the quantum of the spin of matter. Apparently the direction of the spin is irrelevant for gravity.

It may be of interest to review the condition $c^2 r$ = constant numerically for the solar system some time. This is to happen by means of the specifications in *Meyers Handbuch über das Weltall* [Meyer's Handbook on the Universe] (pp. 179/183).[469]

Remarkably, there is the strongest agreement between the product of the square of the average [mid-] orbital speed and the large half-axis of the planetary orbits, and the product of the gravitational constant and solar mass.

Planet	**a × 10^6km**	**v^2 × a km/s**	**$=c^2 r$**
Mercury	57.9	47.9	1.3284
Venus	108.2	35.0	1.3254
Earth	149.6	29.8	1.3285
Mars	227.9	24.1	1.3236
Jupiter	778.0	13.1	1.3351
Saturn	1427	9.6	1.3151
Uranus	2870	6.8	1.3270
Neptune	4496	5.4	1.3110
Pluto	5946	4.7	1.3134

Mean value [average] = 1.3231

$gM_{So} = 1.3234 \times 10^{26}$ cm^3/sec^2

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[469] *Das Wahre Weltbild*, p. 157.

$$(c^2 \times 1\ \text{AE} = 1.3444)$$

> In accordance with the present figures, it is possible, consequently, to calculate the planets' orbits without making use of the notion of gravity. This is apparently to be ascribed to the interpretation of the planetary system as a vortex. The question is now whether gravitation in general can be explained as a vortex effect.

Posch makes this note before the author continues:

> Thus, based on the present insights, we shall attempt to describe a possible solution to this puzzle. Note: What follows is a mathematical derivation of tangential speeds on a circle. After that it says further:
>
> Applied to the problem at hand, this means that every point of mass which, as hinted at in the mentioned essay, can be understood as the sum of space structure vortexes, exists a potential vortex field, whose axis can occupy any spatial direction. Accordingly, the centripetal force of this vortex field is spherically-symmetrical with the intensity $^1/r^2$, in accordance with the equation of Bernoulli, that is, it is identical with the gravitational force. In other words: The gravitational field can be interpreted generally dynamically as an effect of a space-structure movement, similar to the electrostatic field.[470]

Keplerian Anomalies

Concluding this section, Posch adds:

> And that's exactly what Hildegard says! The result of this mathematical study is entirely in agreement with Hildegard's postulate, according to which the planets move around the sun on the basis of an eddy current. Gravity is a force of the winds. From them flows the potential energy that gives weight to matter and forms and builds gravitational fields. The cyclone impels the planets.

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[470] *Das Wahre Weltbild*, p. 158.

Since in the classical world of Newtonian legalities there is no circular motion that continues on its own, a circular orbit must have a force as its cause. These forces are formulated in Newton's theory of mass, whereas the ingenious gentleman left open where these forces come from.

If, then, the orbiting planets use energy (as our vehicles use fuel), then there arises the question: where do the planets get their impulsion energy? According to the first law of Kepler, the planetary orbit is dependent on the relationship of the potential energy of the planet to its kinetic energy. In other words: the spin is taken from the difference between circle and ellipse, for the sum of potential and kinetic energy is always constant. According to the law of the conservation of angular momentum and energy, the demand for energy is passed back and forth between kinetic and potential energy each time.[471] In the perihel, E_{kin} has a maximum, E_{pot} a minimum, whereas in the aphel, E_{pot} reaches a peak and E_{kin} a minimum. Strictly speaking, this is not physics but magic, for there is never any mention of energy consumption!

The First and Second Laws of Kepler apparently make our planetary system into a perpetual motion machine, though even this supposition is already prohibited by science. Nevertheless, for thousands of years the planets have been moving around the sun without any weariness and without wearing themselves out. But there is no magic in the skies. Without this cyclone, no planet would revolve around the sun. The energy comes from *it* – and not from the mass – as we have been able to prove mathematically.

Just as a wind turbine only supplies energy if the wind blows constantly, so the energy demand of the universe must be met by a constant supply of energy, *i.e.*, through a continuous blowing of the cosmic winds. Hildegard confirms the constant supply of energy in the universe: "…for the side winds, incessantly, even if mildly, do not stop blowing air" (*Die göttlichen Werke*, 84).

This permanent blowing of the cosmic winds not only makes possible the revolution of the firmament, it also supplies the

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[471] *Das Wahre Weltbild*, p. 158.

> kinetic energy for the planetary movements, which do not, after all, travel around the sun free of charge. They do not receive their angular momentum reciprocally from the mass, as has been explained hitherto, but through the cyclone. The wind current that flows to it replenishes the constant consumption of energy and keeps the centrifugal and centripetal forces balanced.

Gravitational force must be redefined as vortex force, just as the superrotating disc galaxies show, which cannot be understood either with Newton's or with Einstein's theories of gravity. For the outer regions of the disc galaxies move around their galactic center a lot faster than they could be stabilized with the Newtonian gravitational effect of the inner visible star masses. This behavior can only be explained with vortex systems and their nebula vortex systems. Spiral nebulas in particular, which are very similar to our weather charts, indicate very clearly that there are eddy currents in the universe.[472]

Objection: "At the rotation of the firmament, the fixed stars close to us would already exceed the speed of light many times over.

Response: Here the reasoning is incorrect already. The stars do not move; all of space does. Since the stars do not move, they cannot exceed any speed, either.

Objection: "In the physical world, mass also implies the force of gravity. Now, the sun's mass is so great that it contains 322,800 earth masses, and surely many of the billions of stars have even greater masses. Should it be conceivable that the earth, which is infinitesimally small by comparison, really possesses the necessary gravitational force? It will be impossible to answer this question in the earth's favor."

Response: This argument sounds really silly from Hildegard's point of view. Since space moves and all the stars with it, their orbits do not depend on the earth's gravity. The idea of a gravitational force must be abandoned.[473]

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[472] *Das Wahre Weltbild*, p. 159.

[473] *Das Wahre Weltbild*, p. 162.

The Rotation of the Earth: A Catastrophe!

Have physicists ever thought about what physical consequences a rotating earth would bring about? At the equator the earth's circumference is around 40,000 km.

40,000: 24 (hr) = 1,666 km/h

If the earth rotated, a point at the equator would have to move at 1,666 km/h! That's faster than sound! Sound waves only travel at a speed of 1,200 km/h. How should two people be able to talk to each other if sound waves were slower than the earth's rotation?

He who has experienced how much window panes vibrate when an airplane breaks the sound barrier, can imagine how much energy would have to be used to have a conversation! Due to the law of inertia, the atmosphere [mantle of air], too, would move more slowly than the earth, which would result in hurricane-like storms around the globe. Similarly, the oceans would roar around the globe like the water film on a grinding stone! Like a raging river they would go around the globe and highly flood the continents in a continuous storm surge. Neither the air nor the oceans would be calm for even one moment. A rotating earth would make life on earth impossible, because for us men there would be no chance to survive with permanent flooding [high tide] and a continuous hurricane.[474]

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[474] *Das Wahre Weltbild*, p. 164.

Chapter 13

Modern Science and its Persistent Problems

Critical Remarks from its Own Ranks

Today, science lives in the aura of being a monolithic consensus of truth and impartiality. Unfortunately, this is at best an exaggeration, and often it is simply untrue. Science, like any other endeavor of man, is subject to the weal or woe of human participation and its common foibles. As science walks in the precarious halls of trial and error, it is, contrary to popular opinion, particularly prone to mistaken notions. As scientist Lewis Thomas (d. 1993) recently confided:

> Science is founded on uncertainty…. We are always, as it turns out, fundamentally wrong.…The only solid piece of scientific truth about which I feel totally confident is that we are profoundly ignorant about nature....It is this sudden confrontation with the depth and scope of ignorance that represents the most significant contribution of twentieth-century science to the human intellect.[475]
>
> The principle discoveries in this [20th] century, taking all in all, are the glimpses of the depth of our ignorance about nature. Things that used to seem clear and rational, matters of absolute certainty – Newtonian mechanics for example – have slipped through our fingers, and we are left with a new set of gigantic puzzles, cosmic uncertainties, ambiguities. Some of the laws of physics require footnotes every few years, some are cancelled

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[475] Lewis Thomas, “On Science and Certainty,” *Discover Magazine*, 1980, p. 58. Lewis also quips: “On any Tuesday morning, if asked, a good working scientist will tell you with some self-satisfaction that the affairs of his field are nicely in order, that things are finally looking clear and making sense, and all is well. But come back again on another Tuesday, and the roof may have just fallen in on his life’s work”; “In real life, every field of science is incomplete, and most of them – whatever the record of accomplishment during the last 200 years – are still in their very earliest stages.”

> outright, some undergo revised versions of legislative intent like acts of Congress.[476]

Karl Popper, one of the more respected secular philosophers, issued major critiques throughout his life on the industry of science. He writes:

> For us therefore, science has nothing to do with the quest for certainty or probability or reliability. We are not interested in establishing scientific theories as secure or certain, or probable….It can even be shown that all theories, including the best, have the same probability, namely zero….the realization that our attempts to see and to find the truth are not final, but open to improvement; that our knowledge, our doctrine, is conjectural; that it consists of guesses, of hypotheses rather than of final and certain truths.[477]

Since most people are not familiar with the intricacies of research and discovery, the doctrines concerning the mechanical workings of the universe are inevitably left to what modern society has come to know as "the scientist." Today, those with credentials in theology, or even philosophy, are invariably ignored when the crucial decisions are made regarding what will be taught in the universities. The sad truth is, however, that an inordinate number of scientists are employed for their own selfish interests, and never consider, let alone seek, an authority above themselves. Statistics reveal just how bad it has become. *Scientific American* carried an article a few years ago on the work of James H. Leuba, a statistician who both in 1914 and 1933 surveyed the religious beliefs of American biological and physical scientists of their views on two fundamental beliefs in Christianity: (1) the worship of God and (2) the existence of an afterlife. This study was important to Leuba since, as he said, "scientists enjoy great influence in the modern world, even in matters religious."[478] At first glance, Leuba's results seem somewhat reassuring. Among a general cross section of scientists, he found that 40% believed in God. But then he concentrated on the more elite scientists, those whose names are in the newspapers, who write the major books and articles, and who have the most influence on what the public believes. He found that an astonishing "80 percent of top natural scientists rejected both cardinal beliefs of traditional Christianity." *Scientific American* then did its own study and found even worse results. Using the 1,800 members of the 1998 *National Academy of Sciences* as its measure of who comprised the "elite scientists" of the day, the editors found that:

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[476] Lewis Thomas, "Making Science Work," *Discover*, March 1981, p. 88.

[477] Karl Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge*, 1963, 1965, pp. 229, 192, 151. Popper opens with: "The title of this lecture is likely, I fear, to offend some critical ears. For although 'Sources of Knowledge' is in order, and 'Sources of Error' would have been in order too…" (*ibid.*, p. 3).

[478] "Scientists and Religion in America," Edward J. Larson and Larry Witham, *Scientific American*, Sept. 1999, p. 89.

> Disbelief among NAS members responding to our survey exceeded 90 percent….NAS biologists are the most skeptical, with 95 percent of our respondents evincing atheism and agnosticism. Mathematicians in the NAS are more accepting: one in every six of them [17%] expressed belief in a personal God.[479]

Commenting further, the article shows that atheism is encouraged in academic circles, and those who have any Christian beliefs are quietly suppressed:

> University of Washington sociologist Rodney Stark…points out, "There's been 200 years of marketing that if you want to be a scientific person you've got to keep your mind free of the fetters of religion."….higher education on the whole winnows out the idea of God or people who hold it. In research universities, "the religious people keep their mouths shut," Stark says. "And the irreligious people discriminate. There's a reward system to being irreligious in the upper echelons."[480]

The reasons for this rampant atheism are then discovered:

> Legendary evolutionary biologist Ernst Mayr, an NAS member since 1954, made a study of disbelief among his Harvard University colleagues in the academy. "It turned out we were all atheists," he recalls. "I found that there were two sources." One Mayr typified as, "Oh, I became an atheist very early. I just couldn't believe all that supernatural stuff." But others told him, "I just couldn't believe that there could be a God with all this

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[479] *Ibid.*, p. 90.
[480] *Ibid.*, p. 91.

> evil in the world." Mayr adds, "Most atheists combine the two. This combination makes it impossible to believe in God."[481]

How ironic is it that atheistic men are using religious and moral principles to judge whether God exists. With the audacity of a woman of the night, they dare blame God for the evil in the world.[482] Scripture has quite a different scenario, of course. It solemnly testifies that God blames man for the evil in the world. As Genesis 6:5-6 laments before the Great Flood:

> The Lord saw that the wickedness of man was great in the earth, and that every imagination of the thoughts of his heart was only evil continually. And the Lord was sorry that he had made man on the earth, and it grieved him to his heart.

Thus, we would ask, rhetorically: who is right about the cause of the world's evil? Is it the scientist or is it God who cannot lie and declares in Romans 3:10-18:

> There is none righteous, no, not one; no one understands, no one seeks for God. All have turned aside, together they have gone wrong; no one does good, not even one. Their throat is an open grave, they use their tongues to deceive. The venom of asps is under their lips. Their mouth is full of curses and bitterness. Their feet are swift to shed blood, in their paths are ruin and misery, and the way of peace they do not know. There is no fear of God before their eyes.

Although there are many examples of atheist-driven scientific agendas in the halls of modern science today, one person who particularly fills that description in the field of cosmology is the late Carl Sagan. One of the first exposures a novice has to the godless world of Sagan is this sad statement ascribed to one of his characters in his novel, *Contact*:

> "If God is omnipotent and omniscient, why didn't he start the universe out in the first place so it would come out the way he wants? Why's he constantly repairing and complaining? No, there's one thing the Bible makes clear: The biblical God is a

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[481] *Ibid.*, p. 91.

[482] Proverbs 30:20: "Such is the way of an adulterous woman: she eats, wipes her mouth, and says, 'I have done no wrong.'"

> sloppy manufacturer. He's not good at design, he's not good at execution. He'd be out of business if there was any competition"[483]

Autonomy was Sagan's gospel. As he himself stated: "First: there are no sacred truths…arguments from authority are worthless,"[484] and in the context Sagan is referring to religious authority. In other places he creates fear and resentment against religious authority, portraying it as vicious ogre who is not interested in truth or even discussion. He writes:

> It took the Church until 1832 to remove Galileo's work from its list of books which Catholics were forbidden to read….The high water mark in recent history is the 1864 *Syllabus of Errors* of Pius IX, the pope who also convened the Vatican Council at which the doctrine of papal infallibility was, at his insistence, first proclaimed….But surely the Inquisition ushering in the elderly and infirm Galileo in to inspect the instruments of torture in the dungeons of the Church not only admits but requires just such an interpretation. This was not mere scientific caution and restraint, a reluctance to shift a paradigm until compelling evidence, such as the annual parallax, was available. This was fear of discussion and debate. Censoring alternative views and threatening to torture their proponents betray a lack of faith in the very doctrine and parishioners that are ostensibly being protected.[485]

In place of traditional religion, science has become a religion in its own right. In essence, it has been turned from science to *Scientism*. Its advocates preach its subjective beliefs just as strongly as any modern gospel evangelist. Whereas in the past the Church was the supreme authority, *Scientism* has no peer today. As it seeks converts it presents as its foundation stone the Copernican revolution. In the words of Gunther Stent, a biologist at Berkeley:

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[483] Spoken by the character Sol Hadden in Carl Sagan's *Contact*, 1985, 1997, p. 285. The prior sentences state: "All this speaks of incompetence. If God didn't want Lot's wife to look back, why didn't he make her obedient, so she'd do what her husband told her? Of if he [God] hadn't made Lot such a s---head [expletive deleted], maybe she would've listened to him more."

[484] Carl Sagan, *Cosmos*, 1980, p. 333, and *Broca's Brain*, 1979, p. 62.

[485] *Pale Blue Dot*, pp. 40-41.

> In the wake of the publication of Darwin's *On the Origin of Species*, the idea of progress was raised to the level of a scientific religion….This optimistic view came to be so widely embraced in the industrialized nations…that the claim that progress could presently come to an end is now widely regarded as outlandish a notion as was in earlier times the claim that the Earth moves around the sun.[486]

The public, who is pacified by such things as cell phones, antibiotics, jet planes, and computers, will rarely challenge the claims of modern science or attempt to upset the *status quo*, since whatever problems science may have, still, it makes our lives more comfortable than those who lived in the medieval era. But the sad fact is, except for a few basic ideas, today's science is very confused and it is at a loss to explain most of what it observes in nature, especially in the areas of cosmology and cosmogony. In most cases it is completely on the wrong track. As John Horgan notes:

> …sometimes the clearest science writing is the most dishonest…Much of modern cosmology, particularly those aspects inspired by unified theories of particle physics and other esoteric ideas, *is* preposterous. Or, rather, it is ironic science, science that is not experimentally testable or resolvable even in principle and therefore is not science in the strict sense at all. Its primary function is to keep us awestruck before the mystery of the cosmos.[487]

The universe is so complex and so bewildering that honest scientists are only too willing to admit that the more data that scientific instruments attain, the more difficult becomes the task to make sense of it all. As astronomer Fred Hoyle summed it up: "The whole history of science shows that each generation finds the universe to be stranger than the preceding generation ever conceived it to be."[488] Biologist J. B. S. Haldane quipped: "The universe is not only queerer than we supposed, but queerer than we can suppose."[489] In brief, knowledge is abundant; but proper interpretation of the knowledge is severely lacking. Astronomer Halton

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[486] G. Stent, *The Paradoxes of Progress*, 1978, p. 27.

[487] John Horgan, *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age*, 1997, pp. 93-94.

[488] Fred Hoyle, *Astronomy and Cosmology*, San Francisco, 1975, p. 48. Interestingly enough, Hoyle makes the comment in a context concerning whether the heliocentric or geocentric system is the correct model.

[489] Attributed, not verified.

Arp reminds us: "Really all we have for data in astronomy is photons as a function of x and y and frequency. The challenging puzzle is then to try to reason out how nature works,"[490] and that, indeed, is a very difficult task without the proper guidance.

The Guardians at the Gate of Knowledge

Unfortunately, as scientists placate the populace with creature comforts they, in turn, have enjoyed the god-like status they have attained in the eyes of the adoring public. But the real truth is that today's gods of science fight amongst themselves just like the mythical gods of ancient Greece or Rome because, when all is said and done, they are certain of very little of what is going on in the universe. They have lots of information but in the main they are at a loss to make sense of it all. Everyone has an assortment of facts. But correct interpretation is the key to truth, and most scientists fail at this point. The universe is simply too complex for their tiny theories.

Nevertheless, since almost everyone has been convinced that the Earth revolves around the sun, anyone who even attempts to espouse the opposite view is immediately classified in the fringe category; someone, perhaps, who still believes in a flat Earth and spends his day donning an aluminum foil hat waiting for messages from outer space. Whatever their reasons, most scientists and laymen will simply not consider the possibility of a motionless Earth in the center of the universe, no matter what the scientific evidence shows them. If one should dare to persist and challenge them, they will not hesitate to become abusive. Thomas Kuhn observes:

> During the century and a half following Galileo's death in 1642, a belief in the Earth–centered universe was gradually transformed from an essential sign of sanity to an index, first, of inflexible conservatism, then of excessive parochialism, and finally of complete fanaticism. By the middle of the seventeenth century it is difficult to find an important astronomer who is not Copernican; by the end of the century it is impossible…[491]

Or as Lakatos notes:

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[490] Halton Arp, *Seeing Red: Redshifts, Cosmology and Academic Science*, 1998, p. 208.

[491] Kuhn, *The Copernican Revolution*, 1959, p. 227.

> The Ptolamaists did their thing and the Copernicans did theirs and at the end the Copernicans scored a propaganda victory….Therefore the acceptance of the Copernican theory becomes a matter of metaphysical belief.[492]

But it still remains true that people are set free by truth. Falsehoods keep them in darkness and force them to live in an illusion, under oppression, ultimately destroying them. Fortunately, man is blessed with an innate desire to find the truth, put there by his Creator. Often this desire is difficult to satisfy because various ideologues of the world have a vested interest in keeping the rest of the human race in ignorance in order to advance their own agnostic or atheistic agenda, while casting aspersions on those who reject their godless worldview. As we have seen, however, the evidence for a central and immobile Earth is so abundant that one might find himself asking that haunting question: who, in fact, are the real fringe cases? Are they people who have put their trust in divine revelation and the corroborating evidence from science, or are they people like Carl Sagan who espouse such celestial gods as:

> We are the local embodiment of a Cosmos grown to self-awareness. We have begun to contemplate our origins. We are star-stuff pondering the stars! Our ancestors worshipped the Sun, and they were not that foolish. It makes sense to revere the Sun and the stars, for we are their children.[493]

Indeed, the same thing happened among Sagan's "ancestors." As the Old Testament records:

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[492] Imre Lakatos and Elie Zahar, "Why Did Copernicus' Research Program Supersede Ptolemy's," *The Copernican Achievement*, ed. Robert S. Westman, 1975, p. 367.

[493] Carl Sagan, *Cosmos*, 1980, p. 243. As the rock icon Joni Mitchell sang: "I came upon a child of God / He was walking along the road / And I asked him, where are you going / And this he told me… / We are stardust, billion year old carbon. / We are golden. / And we've got to get ourselves back to the garden" (Woodstock, 1969). The Vatican's liberal-minded astronomer, Fr. George V. Coyne, S.J., said much the same in a recent interview: "There is no other way…to have the abundance of carbon necessary to make a toenail than through the thermonuclear processes in stars. We are all literally born of stardust" (*The Catholic Review*, 8-18-2005, p. A32). Suffice it to say, stellar "thermonuclear process" is an unproven science, and is now facing considerable contradictions from Plasma cosmology.

> All men are vain, in whom there is not the knowledge of God: and who by these good things that are seen, could not understand Him that is, neither by attending to the works have acknowledged who was the workman: But have imagined either the fire, or the wind, or the swift air, or the circle of the stars, or the great water, or the sun and moon, to be the gods that rule the world. With whose beauty, if they, being delighted, took them to be gods: let them know how much the Lord of them is more beautiful than they: for the first author of beauty made all those things. Or if they admired their power, and their effects, let them understand by them, that He that made them, is mightier than they: For by the greatness of the beauty, and of the creature, the Creator of them may be seen, so as to be known thereby.[494]

Coming from the same atheistic background, former cabinet member of the Clinton administration, Robert Reich, knows who the real combatants are. In a recent article he stated:

> The great conflict of the 21st century will not be between the West and terrorism. Terrorism is a tactic, not a belief. The true battle will be between modern civilization and anti-modernists; between those who believe in the primacy of the individual and those who believe that human beings owe their allegiance and identity to a higher authority; between those who give priority to life in this world and those who believe that human life is mere preparation for an existence beyond life; between those who believe in science, reason, and logic and those who believe that truth is revealed through Scripture and religious dogma.[495]

Reich, of course, is on the side of the modernists, the individualists, and the here-and-now autonomous logicians. In short, those who believe in God are Reich's enemies.

Why do men succumb to such alternatives when they know the path of truth and goodness? Scripture calls it "the *mystery* of iniquity," and, seeing how many terrible consequences men suffer because of their evil, to witness their continual denial of God is, indeed, a great mystery. Modern man seems to do whatever he can to make himself god-like so as to push the true God off the stage. In no better place is this evident than in modern man's cosmological theories. With a whisk of his mathematical wand, he, like God, can create any universe of his choosing. As physicist J. J. Thomson once noted:

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[494] Wisdom 13:1-5 (RSV).

[495] Robert Reich, "The Last Word," *The American Prospect*, July 1, 2004.

> "We have Einstein's space, de Sitter's space, expanding universes, contracting universes, vibrating universes, mysterious universes. In fact the pure mathematician may create universes just by writing down an equation, and indeed if he is an individualist he can have a universe of his own."[496]

As astrophysicist Gerard de Vaucouleurs put it:

> Less than 50 years after the birth of what we are pleased to call "modern cosmology," when so few empirical facts are passably well established, when so many different over-simplified models of the universe are still competing for attention, is it, may we ask, really credible to claim, or even reasonable to hope, that we are presently close to a definitive solution of the cosmological problem?…. Unfortunately, a study of the history of cosmology reveals disturbing parallelisms between modern cosmology and medieval scholasticism; often the borderline between sophistication and sophistry, between numeration and numerology, seems very precarious indeed. Above all I am concerned by an apparent loss of contact with empirical evidence and observational facts, and, worse, by a deliberate refusal on the part of some theorists to accept such results when they appear to be in conflict with some of the present oversimplified and therefore intellectually appealing theories of the universe…doctrines that frequently seem to be more concerned with the fictitious properties of ideal (and therefore nonexistent) universes than with the actual world revealed by observations.

He adds:

> With few exceptions modern theories of cosmology have come to be variations on the homogeneous, isotropic models of general relativity. Other theories are usually referred to as 'unorthodox,' probably as a warning to students against heresy. When inhomogeneities [NB: theories that can lead to an Earth-centered

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[496] *Einstein: Life and Times*, p. 301. Misner, Thorne and Wheeler list seven distinct universes that can come from changing the mathematical variables of General Relativity (*Gravitation*, p. 747), let alone the numerous variations of other models, *e.g.*, Steady State and Plasma universes.

> universe] are considered (if at all), they are treated as unimportant fluctuations amenable to first-order variational treatment….But if nature refuses to cooperate, or for a time remains silent, there is a serious danger that the constant repetition of what is in truth merely a set of *a priori* assumptions (however rational, plausible, or otherwise commendable) will in time become accepted dogma that the unwary may uncritically accept as established fact or as an unescapable logical requirement. There is also the danger inherent in all established dogmas that the surfacing of contrary opinion and evidence will be resisted in every way.[497]

Much of today's confusion is due to the spooky world of Quantum Mechanics, which hasn't fared any better than Einstein's Relativity in making sense of it all. Faced with atomic particles that seem to have a mind of their own and don't obey the laws that the experimenters demand from them, today's scientists have left us with some of the wildest and most fantastic speculations and theories ever concocted by grown men. As **Stephen Weinberg** notes, "The techniques by which we decide on the acceptance of physical theories are extremely subjective."[498] Or as Robert Matthews reviews it:

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[497] Gerard de Vaucouleurs, "The Case for a Hierarchial Cosmology," *Science*, v. 167, No. 3922, 1970, pp. 1203-1204.

[498] As quoted in an interview with John Horgan and cited in John Horgan, *The End of Science*, 1996, p.74. In the interview Horgan notes: "Weinberg retorted, in effect, that he does not see why we should be interested in a God who seems so little interested in us, however good he is at geometry" (*ibid*., p. 77). At the 2006 Salk Institute forum, Weinberg stated: "Anything that we scientists can do to weaken the hold of religion should be done and may in the end be our greatest contribution to civilization" (*New York Times*, Nov. 21, 2006).

> Take quantum theory…Over the past century it has passed every single test with flying colours, with some predictions vindicated to 10 places of decimals. Not surprisingly, physicists claim quantum theory as one of their greatest triumphs. But behind their boasts lies a guilty secret: they haven't the slightest idea why the laws work, or where they come from. All their vaunted equations are just mathematical lash-ups, made out of bits and pieces from other parts of physics whose main justification is that they seem to work.[499]

The newest twist for Quantum Mechanics is the "anthropic principle" wherein the complexity and fine-tuning of the universeman is explained by the fact that, by pure chance in quantum fluctuations, we humans happen to fit into this particular universe and are therefore significant in that sense only. Other universes have other rules that they go by, but ours becomes what it is by our mere existence and observation of it. Such self-deification, to create matter *ex nihilo* like God, is the ultimate quest of modern science.[500]

Much of the confusion started when Einstein made a wrong turn interpreting the Michelson-Morley experiment, and when Quantum scientists took a dangerous detour after Paul Dirac's prediction and Carl Anderson's discovery of the positron. They concluded that matter and energy could be created and destroyed. Since this interpretation, even though it produced absurd results,[501] helped save the reigning paradigm of the Standard Model, it was all kept very quiet. The inventor of this methodology was physicist **Richard Feynman**, but he was honest enough to admit that it was:

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[499] Robert Matthews, *New Scientist*, Jan. 30, 1999, p. 24.

[500] See this site for a brief explanation: http://physics.about.com/od/astronomy/f/AnthropicPrinciple.htm. John D. Barrow and Frank J. Tipler, *The Anthropic Cosmological Principle*, 1986, pp. 677f. Nick Herbert, *Quantum Reality: Beyond the New Physics: An Excursion into Metaphysics and the Meaning of Reality*, 1987, pp. 16-29. John A. Wheeler, "Bohr, Einstein, and the Strange Lesson of the Quantum," *Mind and Nature*, ed., Richard Q. Elvee, 1981, pp. 18-20. George Greenstein, *The Symbiotic Universe: Life and Mind in the Cosmos*, 1988, pp. 222-224.

[501] The mathematics of the so-called "Standard Model" of the atom has the unfortunate anomaly of producing an electron with infinite rest mass. Since by other means science has determined the rest mass to be 0.511 MeV, it requires a "renormalization" of the Standard Model's mathematics, namely, the 0.511 value is added in by hand, and no one is the wiser. This procedure is justified on the basis that "positive infinity divided by negative infinity" is an indeterminate value, and thus 0.511 is just as good as any other figure to add in (see D. L. Hotson "Dirac's Equation and the Sea of Negative Energy" *Infinite Energy*, Issue 43, 2002, p. 3).

> The shell game that we play…called 'renormalization.' But no matter how clever the word, it is what I would call a dippy process! Having to resort to such hocus pocus….I suspect that renormalization is not mathematically legitimate.[502]

Asked, then, why he was awarded the Nobel Prize, Feynman replied, "We have designed a method for sweeping them under the rug."[503]

Richard Feynman (1918 – 1988)

D. L. Hotson shows just how much "hocus pocus" is involved in these schemes:

> His professors taught that conservation of mass-energy is the never-violated, rock-solid foundation of all physics. In "pair-production," a photon of at least 1.022 MeV "creates" an electron-positron pair, each with 0.511 MeV of rest energy, with

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[502] Feynman in *The Strange Theory of Light and Matter*, 1985, p. 128.

[503] James Gleick, *Genius: The Life and Science of Richard Feynman*, 1992, p. 378. Feynman's remark was not said in jest. Gleick prefaces it with: "He did make a serious remark – and repeated it all day – that reflected his inner feeling about renormalization. The problem had been to eliminate infinities in calculations, he said, and 'We have designed a method for sweeping them under the rug." Concerning physics' newest brainchild, String Theory, Feynman states: "I am an old man now, and these are new ideas, and they look crazy to me, and they look like they're on the wrong track….I do feel very strongly that this is nonsense" (P. C. W. Davies and J. Brown, *Superstrings – A Theory of Everything*, Cambridge Univ. Press, 1998, pp. 193-194).

> any excess being the momentum of the "created" pair. So supposedly the conservation books balance. But the "created" electron and positron both have spin (angular momentum) energy of $\hbar/4\pi$. By any assumption as to the size of electron or positron, this is far more energy than that supplied by the photon at "creation." "Isn't angular momentum energy?" he asked a professor. "Of course it is. This half-integer spin angular momentum is the energy needed by the electron to set up a stable standing wave around the proton. Thus it is responsible for the Pauli Exclusion principle, hence for the extension and stability of all matter. You could say it is the sole cause of the periodic table of elements." "Then where does all this energy come from? How can the 'created' electron have something like sixteen times more energy than the photon that supposedly 'created' it? Isn't this a huge violation of your never-violated rock-solid foundation of physics?" "We regard spin angular momentum as an 'inherent property' of electron and positron, not as a violation of conservation." "But if it's real energy, where does it come from?" "'Inherent property' means we don't talk about it, and you won't either if you want to pass this course." Later, Mr. Hotson was taken aside and told that his "attitude" was disrupting the class, and that further, with his "attitude," there was no chance in hell of his completing a graduate program in physics, so "save your money." He ended up at the Sorbonne studying French literature and later became a professional land surveyor.[504]

Irrespective of the exploits of the Quantum world, in the macro-world Copernican cosmology is the *sine qua non* of the science establishment. It goes by one of two names in today's scientific literature: *The Copernican Principle* (for those who are bold enough to admit the basis for their agenda), or *The Cosmological Principle* (for those who believe Copernicus is the foundation for modern science but choose labels that are less obvious). Whatever the name, it is a fact that no other scientific hypothesis comes close to the effect that removing the Earth from the center of the universe has had upon the thinking and aspirations of mankind. As we noted in Volume I, Stephen Gould claimed that the common feature of all science is the removal of Earth from the center of the universe, and Stephen Hawking added that this removal has divested mankind of certainty, eternity, and absolutes. This is the wonderful life, a world they have created for themselves, a world in which they can be judged by nothing bigger than themselves.

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[504] D. L. Hotson, "Dirac's Equation and the Sea of Negative Energy," *Infinite Energy*, 8, 43, 2001, p. 37.

Diametrically opposed to Gould's and Hawking's doctrine, of course, is the God of Scripture. The fact that man was placed in the center of the universe is apparently a very important piece of information to reveal to us, since the opening words of Genesis begin not with a detailed description about God, but about the Earth that God created before anything else, and which was furbished several days before the other celestial bodies were placed as its surrounding adornment.[505] Unfortunately, men have long since forgotten Genesis, relegating it to the dustbin of myths and legends. In fact, with the coming and going of about a dozen or so cosmological theories since the time of Galileo, we will see that each one has systematically tried to eliminate the need for the Genesis Creator. In their pursuit, however, they soon found that each cosmology proposed by their best and brightest was seriously flawed, and, by their own calculations, men were stuck with the reality that the universe had a beginning, whether they liked it or not.

Still, they try to escape the inevitable and, like Stephen Hawking, ask silly questions such as: "What place, then, for a creator?"[506] Or, they seek to convince the public with absurd tautologies like those of Carl Sagan: "A universe that is infinitely old requires no Creator."[507] In essence, infinity has become science's god – a cold, impersonal, and unfathomable entity that mankind can neither comprehend nor repay. Through these false gods man attempts to dethrone the true God of heaven and Earth. This quest is nothing new, of course. It was the very lie with which the devil tempted our first parents, saying: "God knows in the day you eat of it *you shall become as gods*, knowing good and evil."[508]

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[505] "In the beginning God created the heavens and the earth. The earth was without form and void, and darkness was upon the face of the deep; and the Spirit of God was moving over the face of the waters. And God said, 'Let there be light'; and there was light."

[506] Stephen Hawking, *A Brief History of Time: From the Big Bang to Black Holes*, 1988, p. 141. In his second book Hawking expands on the idea, treating the universe as being god-like, without beginning or end: "The universe would be completely self-contained and not affected by anything outside of itself. It would neither be created nor destroyed. It would just BE. As long as we believed the universe had a beginning, the role of a creator seemed clear. But if the universe is really completely self-contained, having no boundary or edge, having neither beginning nor end, then the answer is not so obvious: what is the role of a creator?" (*A Briefer History of Time*, 2005, p. 103); later adding the naïve remarks: "Or does it need a creator, and if so, does He have any other effect on the universe? And who created Him?" (*ibid.*, p. 142). According to John Horgan: "There is no place, was his reply; a final theory would exclude God from the universe, and with him all mystery. Like Stephen Weinberg, Hawking hoped to rout mysticism, vitalism, creationism from one of their last refuges, the origin of the universe. According to one biographer, Hawking and his wife, Jane, separated in 1990 in part because she, as a devout Christian, had become increasingly offended by his atheism" (*The End of Science*, pp. 94-95). In another place Hawking wrote: "What I have done is to show that it is possible for the way the universe began to be determined by the laws of science. In that case, it would not

The innate desire to imitate our Creator, which God has instilled in man as a worthy goal to attain, took a terrible detour with our first parents. Failing, however, to learn from this tragic lesson, modern man, including the ecclesiastics who have bowed themselves to science's whims through the abracadabra of "biblical criticism," do everything they can to erase the relevance or even existence of Adam and Eve from our collective consciences, preferring instead to believe that monkeys are our uncles. Instead of bowing before Him in respect of St. Paul's admonition that "…ever since the creation of the world, His invisible attributes of eternal power and divinity have been able to be understood and perceived in what He has made,"[509] they make silly caricatures of God and, as St. Paul forewarns us, they "worship the creation rather than the Creator,"[510] as Carl Sagan proves for us:

> The idea that God is an oversized white male with a flowing beard who sits in the sky and tallies the fall of every sparrow is ludicrous. But if by God one means the set of physical laws that govern the universe, then clearly there is such a God. This God is

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be necessary to appeal to God to decide how the universe began. This doesn't prove that there is no God, only that God is not necessary." Sometimes Hawking seems to deify the universe, or attribute things to it that religion attributes to God alone. He writes: "Yet in another kind of time, the universe has no boundary. It is neither created nor destroyed. It just is….The inflation was a good thing in that it produced all the content of the universe quite literally out of nothing. When the universe was a single point, like the North Pole, it contained nothing" (*Black Holes and Baby Universes*, pp. 68, 97).

[507] Carl Sagan, *Cosmos*, 1980, p. 249. See also Sagan's contemptuous books against religion, *e.g.*, *Broca's Brain*, 1979, and *Dragons of Eden*, 1977.

[508] Genesis 3:5.

[509] Romans 1:20. As Immanuel Kant once noted: "Two things fill the mind with ever new and increasing wonder and awe…the starry heaven above me, and the moral law within me."

[510] Romans 1:25.

> emotionally unsatisfying. It does not make much sense to pray to the law of gravity.[511]

There is probably no better example of the dilemma of modern man than Carl Sagan. God doesn't take kindly to such remarks, however. As Scripture declares, He is never mocked.[512] Anyone with a proper understanding of God, which he can quickly glean from even a cursory reading of the narratives of Scripture, will realize that He often gives man the godless world that he wants – as punishment for ignoring Him.[513] In turn, He will laugh from heaven when their calamities strike.[514] Dr. Gould, Dr. Sagan, and Dr. Einstein, all of them now deceased, should have known these Scriptures very well, since at least those coming from the Old Testament were part of their formative years.[515]

The bare truth is: if one acts like an animal (which is the case when men pretend God doesn't exist), then God will allow one to believe one is descended from an animal. Stephen Gould reflects this very fact when he states that we have become "large reasoning animals" and we owe this to "our lucky stars."[516] Ironically, like pigs wallowing in the mud or dogs eating their own vomit, modern man seems all too comfortable with such demotion and degradation. He'll accept any harebrain idea as long as it allows him to escape bowing down to an Almighty Being. Alan Rauch shows us why, and, not surprisingly, it all goes back to the disdain for an Earth-centered cosmos:

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[511] Sagan, as quoted in *U.S. News and World Report*, December 23, 1991, p. 61. Similar quotes from Sagan include: "A naïve Western view of God is an outsize, light-skinned male with a long white beard, who sits on a very large throne in the sky and tallies the fall of every sparrow" (*The Varieties of Scientific Experience*, p. 149); "If we long to believe that the stars rise and set for us, that we are the reason there is a Universe, does science do us a disservice in deflating our conceits?....For me, it is far better to grasp the Universe as it really is than to persist in delusion, however satisfying and reassuring" (Carl Sagan, *The Demon-Haunted World: Science As a Candle in the Dark*, 1996, p. 12). "In many cultures it is customary to answer that God created the universe out of nothing. But this is mere temporizing. If we wish courageously to pursue the question, we must, of course ask next where God comes from? And if we decide this to be unanswerable, why not save a step and decide that the origin of the universe is an unanswerable question? Or, if we say that God has always existed, why not save a step and conclude that the universe has always existed?" (Carl Sagan, *Cosmos*, p. 257).

[512] Galatians 6:7 ("Make no mistake: God is not mocked, for a person will reap only what he sows").

[513] *Cf.* 2 Thess. 2:11; Rom. 1:24-31; Num. 11:18-20.

[514] Psalm 37:13; Psalm 59:9; Proverbs 1:26; Habakkuk 1:10; Wisdom 4:18.

[515] Sagan writes: "…as is plainly stated at every Rosh Hashonhan and every Jewish wedding ceremony, the Universe is less than 6,000 years old" (Carl Sagan, *The Demon-Haunted World: Science as a Candle in the Dark*, p. 325). Sagan would also be familiar with the following teaching in Deuteronomy 4:19: "And *beware* not to lift up your eyes to heaven and see the sun and the moon and the stars, all the host of heaven, and be drawn away and worship them and serve them, those which the Lord your God has allotted to all the peoples under the whole heaven."

> Darwin's theory neatly summed up a view of the natural world that did not privilege any living thing over another. Instead, all organisms (including, by implication, humans) were subject to the physical forces of nature and, of course, to each other. Combined with new perspectives on space, time, and matter, *this view removed man from centrality in the universe*. The age-old idea that man was a creature revered by nature and favored by God could no longer be professed without serious misgivings.[517]

Although some scientists pay lip service to "searching for God," in reality the quest of modern man has been a continual effort to remove God from the stage of human history. Ever since the time of Galileo, man has tried to become a god by relying on his own knowledge and effort. Unfortunately, the more he does so, the more detached he becomes and the further away he remains from becoming like God. This is the secret of life. Those who discover it are blessed, indeed. Those who refuse it will be forever mired in futility and frustration. Even DNA discoverer James D. Watson admitted:

> One could not be a successful scientist without realizing that, in contrast to the popular conception supported by newspapers and mothers of scientists, a goodly number of scientists are not only narrow-minded and dull, but also just stupid.[518]

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[516] Stephen Gould, *Wonderful Life*, 1989, p. 318.

[517] Alan Rauch, *Useful Knowledge: The Victorians, Morality And The March of Intellect*, 2001, p. 12, emphasis added.

[518] Unfortunately, Watson was a religious skeptic. At the age of 74 he stated that religious explanations are "myths from the past....Every time you understand something, religion becomes less likely. Only with the discovery of the double helix and the ensuing genetic revolution have we had grounds for thinking that the powers held traditionally to be the exclusive property of the gods might one day be ours." Crick and Watson boasted that their chief goal was to "discredit the existence of God." Francis Crick (d. 2004), recently stated: "The God hypothesis is rather discredited....Archbishop Ussher claimed the world was created in 4004

In spite of this, science has become the weapon of choice for modern man in order to make himself the god of this world, answerable to no one but himself. But he only deceives himself. Although he fights to suppress it, inside each man God has instilled the knowledge that he will one day face judgment for his beliefs and actions. As Sirach assures us:

> Much labor was created for every man, and a heavy yoke is upon the sons of Adam, from the day they come forth from their mother's womb till the day they return to the mother of all. Their perplexities and fear of heart – their anxious thought is the day of death, from the man who sits on a splendid throne to the one who is humbled in dust and ashes, from the man who wears purple and a crown to the one who is clothed in burlap; there is anger and envy and trouble and unrest, and fear of death, and fury and strife. And when one rests upon his bed, his sleep at night confuses his mind. He gets little or no rest, and afterward in his sleep, as though he were on watch, he is troubled by the visions of his mind like one who has escaped from the battlefront; at the moment of his rescue he wakes up, and wonders that his fear came to nothing.[519]

There have been three major attempts in the last five hundred years to make man's dream of removing God from the stage come true. The first was Copernicus' heliocentrism, the second was Darwin's evolution, and the third was Einstein's relativity. Modern scientists instinctively know that all three are immediately falsified if the Earth is motionless in the center of the universe. But if they are successful in dismissing that proposition as "unthinkable," these three theories will continue to rule the hearts of men like no other before them, each propped up by a pseudo-science that purports to know the real truth when in fact it knows very little. Each in its own right is a direct assault on what men previous to them believed to be true based upon a face value reading of the Old and

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BC. Now we *know* it is 4.5 billion old. It's astonishing to me that people continue to accept religious claims. People like myself get along perfectly well with no religious views" (*London Daily Telegraph*, cited in *The Washington Times*, 3-24-2003). But in his more somber moments Crick admitted: "The origin of life appears almost a miracle, so many are the conditions which would have had to be satisfied to get it going….Every time I write a paper on the origin of life, I swear I will never write another one, because there is too much speculation running after too few facts."

[519] Sirach (Ecclesiasticus) 40:1-7.

New Testaments. As the modern scientific icon Paul Davies confirms for us:

> Could this have happened without any supernatural input? Quantum physics seems to provide a loophole to the age-old assumption that "you can't get something for nothing." Physicists are now talking about "the self-creating universe": a cosmos that erupts into existence spontaneously... The question of whether the details of this theory are right or wrong are not so very important. It is now possible to conceive of a scientific explanation for all creation…Has modern physics abolished God altogether?[520]

The implication of Davies' statement is that modern physics has, indeed, abolished the need for God. But Davies is not alone. As we saw with Stephen Hawking's "what place, then, for a creator?" this convenient '*sine Deo et ex nihilo*' universe is a common belief among today's cosmologists.[521] Being a little more honest about modern cosmology's naked emperor, astrophysicist Andrei Linde revealed why many have been forced to the absurd "something from nothing" position:

> The first, and main, problem is the very existence of the Big Bang. One may wonder, What came before? If space-time did not exist then, how could everything appear from nothing? What arose first: the universe or the laws determining its evolution? Explaining this initial singularity – where and when it all began

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[520] Paul Davies, *God and the New Physics*, 1983, p. viii. In two letters sent to me, dated August 8-9, 2004, Davies confirmed my assessment of his views, stating: "In a nutshell, I have always argued against invoking any sort of God to create the universe in the big bang. I think physics can explain the big bang without supernatural input. The correct place to locate God-questions is in the laws of physics, not the initial conditions….I have long argued against the notion of any sort of God who resides within time, and who preceded the universe…The classical Christian doctrine of creation "ex nihilo" does NOT mean that God created the world at some moment in time as a temporal act. This is a mis-reading of classical theology" (Letters on file). Ralph Estling states that he also contacted Davies about this question. Estling writes: "I've had correspondence with Paul Davies on cosmological theory…I asked him what he meant by 'Nothing.' He wrote back that he had asked Alexander Vilenkin…and Vilenkin had replied, 'By Nothing I mean Nothing'" (*Skeptical Inquirer*, January/February, 1995, pp. 69-70).

[521] Meaning: "Without God and out of nothing."

> – still remains the most intractable problem of modern cosmology.[522]

A few physicists tried to answer the question. In 1973 Edward P. Tryon fired the first shot: "I proposed that our Universe had been created spontaneously from nothing, as a result of the established principles of physics."[523] Alan Guth of M.I.T. and Paul Steinhardt of Princeton followed in 1984 with an article stating:

> The inflationary model of the universe provides a possible mechanism by which the observed universe could have evolved from an infinitesimal region. It is then tempting to go one step further and speculate that the entire universe evolved from literally nothing.[524]

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[522] Andrei Linde, "The Self-Producing Inflationary Universe," *Scientific American*, Magnificent Cosmos, 1998, p. 99. Linde then reveals five other problems with the traditional Big Bang theory. To overcome these, Linde posits that "energy in the scalar field" and "quantum fluctuations" produce all the proper ingredients in a super expansion. He writes: "Our universe appears smooth and uniform because all inhomogeneities were stretched $10^{10\wedge 12}$ – that is, a 1 followed by a trillion zeros….This tremendous spurt immediately solves most of the problems of the old cosmological theory" (*ibid*. p. 101). But, he realizes this "may seem too good to be true. Indeed, if all inhomogeneities were stretched away, how did galaxies form? The answer is that while removing previously existing inhomogeneities, inflation at the same time made new ones….The evolution of inflationary theory has given rise to a completely new cosmological paradigm, which differs considerably from the old Big Bang theory and even from the first versions of the inflationary scenario. In it the universe appears to be both chaotic and homogeneous, expanding and stationary. Our cosmic home grows, fluctuates and eternally reproduces itself in all possible forms, as if adjusting itself for all possible types of life" (*ibid*., p. 102).

[523] Edward P. Tryon, "What Made the World?" *New Scientist*, March 1984, p. 15. In another work he stated: "Our universe is simply one of those things which happen from time to time" ("Is the Universe a Vacuum Fluctuation?" *Nature*, 246, December 1973, pp. 396-397).

[524] Alan Guth and Paul Steinhardt, "The Inflationary Universe," *Scientific American*, May 1984, p. 128. To Guth, David Berlinski replied: "Thus, Alan Guth writes in pleased astonishment that the universe really did arise from 'essentially nothing at all'…It would appear, then, that 'essentially nothing' has both spatial extension and mass. While these facts may strike Guth as inconspicuous, others may suspect that nothingness, like death, is not a matter that admits of degrees" (Was There a Big Bang?" *Commentary*, February 1998, p. 37). Berlinski is a member of the Discovery Institute and a Ph.D. in philosophy from Princeton.

More Big Bang theorists jumped on the bandwagon. Physicist John Gribbin followed two years later with these words: “the new models are based on the concept that particles can be created out of nothing at all…matter might suddenly appear in large quantities.”[525] Victor Stenger adds: “What caused it? Not everything requires a cause. It could have just happened spontaneously…”[526] which led scientific satirist Terry Pratchett to conclude: “The current state of knowledge can be summarized thus: In the beginning, there was nothing, which exploded.”[527] Or as Lynda Williams, professional entertainer and physics teacher at San Francisco State University, sang in her latest “Cosmic Cabaret”: “In the beginning, there was nothing” she whispers, and then “BIG BANG!” she screams.[528] The *New York Times* concluded: “The only thing that all the experts agree on is that no idea works – yet.”[529]

Finally, Linde answered his own question by positing that the universe “grows, fluctuates and eternally reproduces itself in all possible forms, as if adjusting itself for all possible types of life.”[530] Assertions such as these prove to us once again how cosmologists can create any universe they wish just by the stroke of a pen. Linde’s universe apparently has a mind of its own, in addition to being eternal. In his logic, one deals with the problem of the origin of the Big Bang by simply claiming that the

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[525] John Gribbin, “Cosmologists Move Beyond the Big Bang,” *New Scientist*, 110, No. 1511, 1986, p. 30.

[526] Victor Stenger, “Was the Universe Created,” *Free Inquiry* 7, 3, Summer, 1987, p. 26. Stenger was a physicist at the University of Hawaii. In a later publication, Stenger added: “The Universe revealed by science shows humanity as an infinitesimal speck in space and time with random chance as an important factor affecting events” (*Free Inquiry* 23, September 2003, p. 40).

[527] Terry Prachett, *Lords and Ladies*, 1996, p. 7.

[528] Philip and Phylis Morrison, “The Big Bang: Wit or Wisdom?” *Scientific American*, February 2001, p. 93. After giving a short history of the repertoire of cosmological theories that have all been overturned, the Morrison’s add: “We simply do not know our cosmic origins; intriguing alternatives abound, but none yet compel. We do not know the details of inflation, nor what came before, nor the nature of the dark, unseen material, nor the nature of the repulsive forces that dilute gravity. The book of the cosmos is still open. Note carefully: we no longer see a Big Bang as a direct solution. Inflation erases evidence of past space, time and matter. The beginning – if any – is still unread. It is deceptive to maintain so long the very term that stood for a beginning out of nothing. The chanteuse will compose a clever new song once the case is clear” (*ibid*., p. 95).

[529] “Before the Big Bang There Was…What?” *The New York Times*, May 22, 2001.

[530] Andrei Linde, “The Self-Producing Inflationary Universe,” *Scientific American*, Magnificent Cosmos edition, 1998, p. 102.

Big Bang itself is eternal; that one Big Bang produces another Big Bang, *ad infinitum*. In short, the Big Bang becomes man's god. That grown men would actually come to the point in which they speak of something coming from nothing, or matter having its own eternity, all in an effort to eliminate the biblical God as the miraculous *ex nihilo* Creator of the universe, is one of the surest signs of modern man's insanity. But this is the religion of *Scientism*, and its believers hold to it just as tenaciously as a Christian holds to Christianity.

For over a thousand years, beginning from the time of Constantine in the early fourth century to the birth of Copernicus in the late fifteenth century, all men of godly heritage believed that the sun and stars revolved around the Earth; that all we see was created directly by God, and that the universe was limited and ordered. Ironically, modern man often calls this period of time (circa 400-1400 AD) the "Dark Ages" because of what they deem as "superstitious" beliefs, but, in reality, a more ominous Dark Ages began about 1400 AD with the advent of Copernicus, since man, spiritually speaking, has been on a steady decline ever since. True, man has invented many material things during this latter period that give the illusion of progress, but Scripture foresaw all of it and wasn't impressed. As God predicted to Daniel concerning our age:

> Many shall run to and fro, and knowledge shall increase…. when the shattering of the power of the holy people comes to an end all these things would be accomplished…. the wicked shall do wickedly; and none of the wicked shall understand; but those who are wise shall understand.[531]

As the context reveals, however, this increased knowledge has only led man to accelerate and to magnify the evil residing in him, an evil that he has never conquered, but merely camouflaged or ignored. There are still barbarians today, only they use pens and computers rather than clubs and swords. When all is said and done, modern technology has only prompted man to do evil more quickly and efficiently, while he ignores God more boldly and pridefully than he ever did before, and *Scientism* has been his blind guide.

Solomon, the wisest of all men, put the attainment of knowledge into proper perspective:

> He has put eternity into man's mind, yet so that he cannot find out what God has done from the beginning to the end….And I

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[531] Daniel 12:4, 7, 10 (RSV).

> saw every work of God, I concluded that man cannot discover the work which has been done under the sun. Even though man should seek laboriously, he will not discover it; and though the wise man should say, "I know," he cannot discover it.[532]

Fortunately, however, science is a two-edged sword. True science will never oppose God or His revelation to us, but today's scientists desperately want us to believe otherwise. Separating science from God is the ultimate quest of modern man.

Is Modern Science Corrupt?

Does modern man possess true science? The answer, in most cases, is no, especially in the field of cosmology. As the Russian Nobel Prize-winning physicist Lev Landau put it: "Cosmologists are often wrong, but never in doubt."[533] Or as Halton Arp noted:

> …the problem is pervasive throughout astronomy and, contrary to its projected image, endemic throughout most of current science. Scientists, particularly at the most prestigious institutions, regularly suppress and ridicule findings which contradict their current theories and assumptions.[534]

And a bit later:

> After a ridiculously long time it has finally dawned on me that establishment scientists actually proceed on the belief that theories tell you what is true and what is not true.[535]

Modern man has only made it appear as if he possesses the truth, since he has learned quite handily that only by giving such impressions can he rule the hearts of men. And that's what it is all about – power over the people.

Most people are under the illusion that science is a monolithic consensus of truth and certainty. The reality is that science is subject to the same forces of fame, fortune, pride, position, politics, ignorance and bias as is any other venture of life. These human frailties often dictate the direction science will take, whether the course turns out to be right or wrong. M.I.T. professor Thomas Kuhn has shaken up quite a few of his scientific colleagues by pointing out these unpleasant realities. In his book *The Structure of Scientific Revolutions*[536] he notes that personalities and politics play a large role in science and its theories. He concludes that scientists can never truly understand the real world, and they understand each other even less. Kuhn, the first to coin the word *paradigm* to describe scientific myopia, reveals that scientists are molded in their thinking by the reigning models of the day, solving problems only within the accepted constraints, and rarely, if ever, challenging those constraints. He shows that the reigning paradigm at first appears to reconcile all experimental results. With time, anomalies begin to appear, which then give way to a new paradigm, but not without a long and arduous fight. As Fred Hoyle notes:

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[532] Ecclesiastes 3:11; 8:17.

[533] As quoted from Dennis Overbye's article in the *New York Times*, "In the Beginning," July 23, 2002.

[534] *Seeing Red: Redshifts, Cosmology and Academic Science*, 1998, p. 12.

[535] *Ibid*., p. 239.

> Science today is locked into paradigms. Every avenue is blocked by beliefs that are wrong, and if you try to get anything published in a journal today, you will run up against a paradigm, and the editors will turn you down.[537]

Kuhn adds that anomalies in scientific experiments are often ignored, at least until so many of them accumulate that scientists are forced to find a new paradigm. Changes occur when someone young and not fully indoctrinated makes a successful bid to overcome past failures. Still, many adopt a new paradigm simply because it is supported by other scientists with strong reputations.

Physicist Chet Raymo of Stonehill College says much the same in his critique:

> Science has evolved an elaborate system of social organization, communication, and peer review to ensure a high degree of conformity with existing orthodoxy.…In a recent article titled “When Do Anomalies Begin?” (*Science*, February 7th, 1992),

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[536] Thomas Kuhn, *The Structure of Scientific Revolutions*, 3rd ed., 1962, 1996. Since 1962, Kuhn’s book has sold over a million copies in 16 languages.

[537] *Scientific American*, “Profile: Fred Hoyle: The Return of the Maverick,” by John Horgan, March 1995, p. 47. In the same article, Horgan notes that, even though Hoyle had some “bizarre ideas,” *Nature* dubbed him “one of this century’s leading scientists.” Horgan begins his article with “…a special fear may creep into the hearts of scientists: What if Fred Hoyle is right? Then astronomy is a sham, biology a house of cards and modern medicine an illusion” (*ibid*., p. 46).

> Alan Lightman of MIT and Owen Gingerich of the Harvard-Smithsonian Center for Astrophysics describe the conservation of science. They acknowledge that scientists may be reluctant to face change for the purely psychological reason that the familiar is more comfortable than the unfamiliar….Usually, say Lightman and Gingerich, such anomalies are recognized only in retrospect. Only when a new theory gives a compelling explanation of previously unexplained facts does it become "safe" to recognize anomalies for what they are. In the meantime scientist often simply ignore what doesn't fit….For some people outside mainstream science, the path toward truth seems frustratingly strewn with obstacles. Like everyone else, scientist can be arrogant and closed-minded.[538]

In a *Newsweek* article, Brian Martin reveals what a cut-throat business science is today:

> Textbooks present science as a noble search for truth, in which progress depends on questioning established ideas. But for many scientists, this is a cruel myth. They know from bitter experience that disagreeing with the dominant view is dangerous – especially when that view is backed by powerful interest groups. Call it suppression of intellectual dissent. The usual pattern is that someone does research or speaks out in a way that threatens a powerful interest group, typically a government, Industry or professional body. As a result, representatives of that group attack the critic's ideas or the critic personally-by censoring

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[538] Chet Raymo, *Sky and Telescope*, 84 (4), 364 (1992). Lightman and Gingerich wrote: "An anomaly in science is an observed fact that is difficult to explain in terms of the existing conceptual framework. Anomalies often point to the inadequacy of the current theory and herald a new one. It is argued here that certain scientific anomalies are recognized as anomalies only after they are given compelling explanations within a new conceptual framework. Before this recognition, the peculiar facts are taken as given or are ignored in the old framework. Such a 'retrorecognition' phenomenon reveals not only a significant feature of the process of scientific discovery but also an important aspect of human psychology….Science is a conservative activity, and scientist are reluctant to change their explanatory frameworks. As discussed by sociologist Bernard Barber, there are a variety of social and cultural factors that lead to conservatism in science, including commitment to particular physical concepts, commitment to particular methodological conceptions, professional standing, and investment in particular scientific organizations" ("When Do Anomalies Begin?" *Science*, 255, 690-695, (1992).

> writing, blocking publications, denying appointments or promotions, withdrawing research grants, taking legal actions, harassing, blacklisting, spreading rumors.[539]

In the new book on the myth of the objectivity of the modern scientist, Derek Hodson reveals the astonishing results from several studies:

> It is commonly asserted that particular personal characteristics and attitudes are essential for the successful pursuit of science, and that scientists themselves all possess a particular cluster of attitudes and attributes, including superior intelligence, objectivity, rationality, open-mindedness, willingness to suspend judgment, intellectual integrity and communiality…. More than 30 years ago, Roe (1961) suggested that scientists themselves do not possess these so-called 'scientific attitudes,' although they think that they do. They, too, subscribe to the myths about the emotionally-detached, disinterested impartiality of the scientist. Or they continue to promote a false image because they perceive it to be in their interests….Roe concludes: "The creative scientist, whatever his field, is very deeply involved emotionally and personally in his work." More recent work by Mahoney (1979) examined the extent to which scientists possess each of the characteristics so frequently ascribed to them. His conclusions are as follows.
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> - Superior intelligence is neither a prerequisite nor a correlate of high scientific achievement.
> - Scientists are often illogical in their work, particularly when defending a preferred view or attacking a rival one.
> - In experimental research, scientists are often selective, expedient and not immune to distorting the data.
> - Scientists are probably the most passionate of professionals. Their theoretical and personal biases often colour their alleged openness to the data.
> - Scientists are often dogmatically tenacious in their opinions, even when contradictory evidence is overwhelming.

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[539] "Stamping Out Dissent," *Newsweek*, April 26, 1993, pp. 49-50.

> - Scientists are not paragons of humility or disinterest. Rather, they are often selfish, ambitious and petulant defenders of personal recognition and territoriality.
> - Scientists often behave in ways which are diametrically opposite to communal sharing of knowledge. They are frequently secretive and occasionally suppress data for personal reasons.
> - Far from being a 'suspender of judgment,' the scientist is often an impetuous truth-spinner who rushes to hypotheses and theories long before the data would warrant.
>
> Mitroff and Mason (1974) distinguish two kinds of scientist: the extreme speculative scientists, who "wouldn't hesitate to build a whole theory of the solar system based on no data at all," and the databound scientists, who "wouldn't be able to save their own hide if a fire was burning next to them because they'd never have enough data to prove the fire was really there." What this and several other studies show is that, contrary to the textbook stereotype, the greater the scientist, the more likely she or he is to belie the myth of the disinterested, uncommitted individual, the "depersonalized and idealized seeker after truth, painstakingly pushing back the curtains which obscure objective reality" (Cawthron and Rowell, 1978).[540]

John E. Chappell, Jr., with whom I had many phone conversations before his recent death, related how in the 1920's when Einstein's theory of General Relativity won the day with what many scientists have come to realize were bogus photographs of starlight bending near the sun (See Vol. 1, Appendix 3), outright censorship began to reign supreme in the halls of many universities. He writes:

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[540] Derek Hodson, "Science fiction: the continuing misrepresentation of science in the school curriculum," 1998, in *Pedagogy, Culture and Society*, 6:2, pp. 205-206, Routledge, 2006. Hodson's references include: A. Roe, (1961) "The Psychology of the Scientist," *Science*, 134, pp. 456-459; P. J. Gaskell, (1992) "Authentic Science and School Science," *International Journal of Science Education*, 14, pp. 265-272; M. J. Mahoney, (1979) "Psychology of the Scientist," *Social Studies of Science*, 9, pp. 349-375; I. Mitroff and R. Mason, "On evaluating the scientific contribution of the Apollo missions via information theory: a study of the scientist-scientist relationship," *Management Science: Applications*, 20, pp. 1501-1513; E. Cawthron and J. Rowell, (1978) Epistemology and science education," *Studies in Science Education*, 5, pp. 31-59.

> One of the most recent comes from a new NPA member who, when doing graduate work in physics around 1960, heard the following story from his advisor: While working for his Ph.D. in physics at the University of California in Berkeley in the late 1920s, this advisor had learned that all physics departments in the U.C. system were being purged of all critics of Einsteinian relativity. Those who refused to change their minds were ordered to resign, and those who would not were fired, on slanderous charges of anti-Semitism. The main cited motivation for this unspeakably unethical procedure was to present a united front before grant-giving agencies, the better to obtain maximal funds. This story does not surprise me. There has been a particularly vicious attitude towards critics of Einsteinian relativity at U.C. Berkeley ever since. I ran into it in 1985, when I read a paper arguing for absolute simultaneity at that year's International Congress on the History of Science. After I finished, the Danish chairman made some courteous remarks about dissidents he had learned about in Scandinavia, and then turned to the audience for questions. The first speaker was one of a group of about 4 young physics students in the back. He launched immediately into a horrible tirade of verbal abuse, accusing me of being entirely wrong in my analysis, a simplification of the Melbourne Evans analysis – "Evans is wrong; you are wrong," he shouted. He accused me of being way out of line to present my "faulty" arguments on his prestigious campus. When I started to ask him, "Then how would you explain...," he loudly interrupted me with "I don't have to explain anything." The rest of the audience felt so disturbed by all this, that the question session was essentially destroyed.[541]

Others have experienced what, for lack of a better term, amounts to a cult of Einstein that has been engineered by very high-placed sympathizers of Einstein's world view. Ruggero M. Santilli writes of his own experience:

> This book is, in essence, a report on the rather extreme hostility I have encountered in U.S. academic circles in the conduction, organization and promotion of quantitative, theoretical, mathematical, and experimental studies on the apparent insufficiencies of Einstein's ideas in face of an ever-growing

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[541] John E. Chappell, Jr., "What Ideas Does The NPA Stand For?" February, 2000.

scientific knowledge. In 1977, I was visiting the Department of Physics at Harvard University for the purpose of studying precisely non- Galilean systems. My task was to attempt the generalization of the analytic, algebraic and geometric methods of the Galilean systems into forms suitable for the non-Galilean ones. The studies began under the best possible auspices. In fact, I had a (signed) contract with one of the world's leading editorial houses in physics, Springer-Verlag of Heidelberg West Germany, to write a series of monographs in the field that were later published in refs. [R. M. Santilli, *Foundations on Theoretical Mechanics*, I: The Inverse Problem in Newtonian Mechanics, Springer-Verlag, NY, 1978] and [R. M. Santilli, *Foundations of Theoretical Mechanics*, II: Birkhoffian Generalization of Hamiltonian Mechanics, Springer-Verlag, NY, 1982]. Furthermore, I was the recipient of a research contract with the U.S. Department of Energy, contract number ER-78-S-02- 4720.A000, for the conduction of these studies. Sidney Coleman, Shelly Glashow, Steven Weinberg, and other senior physicists at Harvard opposed my studies to such a point of preventing my drawing a salary from my own grant for almost one academic year. This prohibition to draw my salary from my grant was perpetrated with full awareness of the fact that it would have created hardship on my children and on my family. In fact, I had communicated to them (in writing) that I had no other income, and that I had two children in tender age and my wife (then a graduate student in social work) to feed and shelter. After almost one academic year of delaying my salary authorization, when the case was just about to explode in law suits, I finally received authorization to draw my salary from my own grant as a member of the Department of Mathematics of Harvard University. But, Sidney Coleman, Shelly Glashow and Steven Weinberg and possibly others had declared to the Department of Mathematics that my studies "had no physical value." This created predictable problems in the mathematics department which lead to the subsequent, apparently intended, impossibility of continuing my research at Harvard. Even after my leaving Harvard, their claim of "no physical value" of my studies persisted, affected a number of other scientists, and finally rendered unavoidable the writing of IL GRANDE GRIDO.[542]

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[542] R. M. Santilli, *Il Grande Grido: Ethical Probe on Einstein's Followers in the*

Reflecting on the views of Michael Polanyi, Catholic historian Philip Sherrard writes:

> Other philosophers of science like Michael Polanyi have spoken of how impossible it is for the scientist not to be influenced by purely subjective factors such as what he expects to see, what other people have persuaded him that he should see, and so on – factors which mean that measurements of temporal and spatial intervals are not just given to the mind but are given to a particular mind deeply and inextricably involved with its own subjective personal prejudices and requirements.
>
> In short, it could be argued that scientists themselves now admit that the best of their theories are but hypotheses, and that these, far from being reached inductively on the basis of objective data, as the old-fashioned empiricist would have it, are for the most part simply postulated as the most probable explanation or interpretation of certain data in accordance with a specific model which the scientist in question happens to have accepted.[543]

Going deeper into our subject, Sherrard compares modern science to Eastern mysticism:

> Indeed, some scientists…claim that what they call the new physics has entirely emancipated itself from the mechanistic worldview of Cartesian and Newtonian physics and has in fact moved close to the worldview of Eastern mysticism. The two basic theories of modern physics – the quantum theory and the theory of relativity – exhibit…all the main features of the Eastern world view.[544]

> Ultimately, if the 'new physics' has performed any positive service it is that it demonstrates more clearly than ever before the total incompetence of modern science to say anything about the nature of the universe in which one can place any trust at all….their attempt to explain many phenomena by their examination of a few is a purely arbitrary process and cannot have anything to do with knowledge in the real sense of the word. Yet this on their own confession is all they are capable of

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U. S. A. : An Insider's View, 1984, p. 7.

[543] Philip Sherrard, *The Rape of Man and Nature: An Enquiry into the Origins and Consequences of Modern Science*, 1987, p. 74.

[544] *Ibid.*, p. 75.

> doing: That all scientific theories and models are by definition approximations, and may be totally inadequate to convey a true picture of the reality with which they purport to be dealing, is a conclusion to which all modern scientific research is condemned by the premises from which it starts.[545]

Finally, an observation that relates directly to our present cosmological debate, Sherrard states:

> In its turn, this revolution may be said to have two main characteristics, which are closely interconnected. The first is that it assumed that knowledge must be based on the observation of external phenomena: it must be based on sense-data without reference to the divine or indeed to any preconceived *a priori* ideas. The second is that it concluded that in order to reduce the data obtained from the observation of external phenomena to a coherent and reliable system of knowledge they must be submitted to the discipline of mathematics….The divorce between religion and philosophy is absolute: concern for the spiritual is banished from the study of physical phenomena and all scientific knowledge must be derived from the observation of a natural world regarded as a self-subsistent entity.[546]

Astronomer Tom van Flandern, once a card-carrying member of the scientific elite, writes how amazed he became when he discovered that almost every theory he had been taught in his professional career was wrong:

> I particularly noted a regular practice of not re-examining the fundamental assumptions underlying a theory once it gained "accepted" status, almost no matter how incompatible some new observations or experiment might be. And I saw powerful vested interests in a "status quo" develop around certain accepted theories. It gradually became clear that a lot of people had a lot to lose if an accepted theory or practice were challenged; the authors of the original theory, whose names had become well-known; all those who published papers which reference or depend on the theory; journal editors and referees who have made decisions or criticized other works based on a theory;

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[545] *Ibid.*, p. 76.
[546] *Ibid.*, p. 95.

> funding agencies which have paid for research which presupposes a theory; instrument builders and experiment designers who spend career time testing ideas which spring from a theory; journalists and writings whose publications have featured or promoted a theory; teachers and interested members of the public who have learned a theory, been impressed by the wonder of it, and who have no wish to have to teach or learn a new theory; and students, who need to find a job in their field of training. It has been my sad observation that by mid-career there are very few professionals left truly working for the advancement of science, as opposed to the advancement of self. And given enough people with strong enough interests, professional peer pressure takes over from there. Peer pressure in science, as elsewhere in society, consists of alternately attacking and ignoring the people who advocate a contrary idea, and discrediting their motives and/or competence, in order to achieve conformity.

Adding to the list, Van Flandern speaks about specialization actually working against the attainment of scientific truth rather than fostering it:

> As if there weren't already enough inertia to major changes of models, I see yet another phenomenon – new to our era of rapid progress in science – which mitigates against change even in the face of overwhelming need for it. Few scientists consider themselves qualified very far outside their own areas of expertise. Since each expert can account for only a small portion of the data dealing with a model, he defers to the other experts to support the model in other areas. Few, if any, scientists have the breadth of knowledge to see the full picture for a given model. So the model remains supported because many individual authorities support it, none of whom have the expertise to criticize the model overall, and all of whom have the utmost confidence in the others collectively. Authorities can continue to multiply indefinitely, with no one taking responsibility for integrating all their combined knowledge. As a result, the existing models get perpetuated regardless of merit or the extent of counter-evidence, because "so many experts can't all be

> wrong." Thus each expert is persuaded to force-fit his own data into the accepted model.[547]

The truth is, not only does modern man know very little about true science, he makes a concerted effort to suppress true science when it conflicts with his pseudo-scientific presuppositions and personal agendas. When their errors can no longer be suppressed, scientists will eventually capitulate, resulting in theories that change every 50-100 years or so. As Max Planck once said: "Science proceeds funeral by funeral."[548] Rather than admitting their past failures, however, modern man hails the newest theory as evidence of his own intellectual prowess, until, of course, his new theory is eventually put on the chopping block and obliterated by the next genius.

After examining several cases of fraud in the science establishment, William Broad and Nicholas Wade made a thorough search into many of its claims. They provide us with the dismal results:

> Our conclusion, in brief, is that science bears little resemblance to its conventional portrait…In the acquisition of new knowledge, scientists are not guided by logic and objectivity alone, but also by such nonrational factors as rhetoric, propaganda, and personal prejudice. Scientists do not depend solely on rational thought, and have no monopoly on it. Science should not be considered the guardian of rationality in society, but merely one major form of its cultural expression.[549]

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[547] Tom van Flandern, *Dark Matter, Missing Planets and New Comets*, 1993, pp. xvii-xviii.

[548] Anecdotal, and possibly an interpolation from his more complete remark: "A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents die and a new generation grows up that is familiar with it." Max Planck's physics teacher once advised him: "Physics is finished, young man. It's a dead-end street," then advised Planck to become a concert pianist instead" (Nick Herbert, *Quantum Reality*, p. 31). A similar statement comes from Mark Twain: "When even the brightest mind in our world has been trained up from childhood in a superstition of any kind, it will never be possible for that mind, in its maturity, to examine sincerely, dispassionately, and conscientiously any evidence or any circumstance which shall seem to cast a doubt upon the validity of that superstition. I doubt if I could do it myself" (attributed, not verified).

[549] *Betrayers of the Truth*, William Broad and Nicholas Wade, 1982, pp. 8-9. Broad and Wade point out the problems with "peer review" (pp. 18-21, 89-102), faulty data collection (pp. 107-125), desire for advancement and continuation of government funding (pp. 88-106), non replication of experiments (pp. 60-87),

Others have revealed the same corruption. Robert Bell, author of *Impure Science: Fraud, Compromise and Political Influence in Scientific Research,*[550] is one of the better. As one reviewer states:

> Bell shows time and again how the supposedly 'objective' scientific-research process is subverted by ego, infighting, and the lure of cold cash….Bell opens his well-researched account with a stunning attack on the scientific community's sacrosanct system of 'peer-review,' which he says often means 'review by one's competition' in today's highly competitive world of scientific research…all too often peer review simply becomes a process by which powerful, well-established scientists can reward their friends and frustrate their rivals….the greatest problem in today's scientific community may well be fraud…particularly in the field of medical research, has resulted in deadly drugs being left on the market and faulty heart valves being implanted in people's chests.[551]

Scientific historian Robert Jahn sees much the same:

> Thus, at the dawn of the 21st century, we again find an elite, smugly contented scientific establishment, but one now endowed with far more public authority and respect than that of the prior version. A veritable priesthood of high science controls major segments of public and private policy and expenditure for research, development, construction, production, education and publication throughout the world, and enjoys a cultural trust and reverence that extends far beyond its true merit. It is an establishment that is largely consumed with refinements and deployments of mid-20th century science, rather than with creative advancement of fundamental understanding of the most profound and seminal aspects of its trade. Even more seriously, it is an establishment that persists in frenetically sweeping legitimate genres of new anomalous phenomena under its

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status-quo obstacles (pp. 126-160), protecting popular scientists and pet projects from scrutiny (pp. 161-180), personal agendas (pp. 181-211). Broad and Wade uncover many discrepancies and problems with Galileo, Newton, Einstein, Darwin, and many other scientists involved with cosmological issues.

[550] Robert Bell, *Impure Science: Fraud, Compromise and Political Influence in Scientific Research*, 1992.

[551] Simon Garfinkel, "When Fraud Taints Science," *Christian Science Monitor*, July 1992.

> intellectual carpet, thereby denying its own well-documented heritage that anomalies are the most precious raw material from which future science is formed.[552]

The problems haven't lessened since Wade (1982) and Bell (1992) revealed their statistics. Horace Judson, from my alma mater, George Washington University, published *The Great Betrayal: Fraud in Science* in 2004 showing that the problems are much worse than two decades ago. As the title denotes, Judson concentrates on the problem of fraud. As the reader digests the case studies Judson presents, he often has to reposition his jaw from the constant downward reflex it is prone to assume.[553]

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[552] Robert G. Jahn, "20th and 21st Century Science: Reflections and Projections," *Journal of Scientific Exploration* 15, 1, 2001, p. 21.

[553] Horace F. Judson, *The Great Betrayal: Fraud in Science*, 2004, p. 463. A recent article titled "Most Scientific Papers are Probably Wrong" in *Science Medicine* says: "Most published scientific research papers are wrong, according to a new analysis. Assuming that the new paper is itself correct, problems with experimental and statistical methods mean that there is less than a 50% chance that the results of any randomly chosen scientific paper are true. John Ioannidis, an epidemiologist at the University of Ioannina School of Medicine in Greece, says that small sample sizes, poor study design, researcher bias, and selective reporting and other problems combine to make most research findings false. But even large, well-designed studies are not always right, meaning that scientists and the public have to be wary of reported findings. 'We should accept that most research findings will be refuted. Some will be replicated and validated. The replication process is more important than the first discovery,' Ioannidis says. In the paper, Ioannidis does not show that any particular findings are false. Instead, he shows statistically how the many obstacles to getting research findings right combine to make most published research wrong. Massaged conclusions: Traditionally a study is said to be 'statistically significant' if the odds are only 1 in 20 that the result could be pure chance. But in a complicated field where there are many potential hypotheses to sift through - such as whether a particular gene influences a particular disease - it is easy to reach false conclusions using this standard. If you test 20 false hypotheses, one of them is likely to show up as true, on average. Odds get even worse for studies that are too small, studies that find small effects (for example, a drug that works for only 10% of patients), or studies where the protocol and endpoints are poorly defined, allowing researchers to massage their conclusions after the fact. Surprisingly, Ioannidis says another predictor of false findings is if a field is "hot", with many teams feeling pressure to beat the others to statistically significant findings. But Solomon Snyder, senior editor at the Proceedings of the National Academy of Sciences, and a neuroscientist at Johns Hopkins Medical School in Baltimore, US, says most working scientists understand the limitations of published research. 'When I read the literature, I'm not reading it to find proof like a textbook. I'm reading to get

Recently, researcher Woo Suk Hwang dazzled the world with his claims of cloning human embryonic stem cells, until he was forced to admit that he fabricated all of it.[554] For years the medical establishment told its patients that low-fat diets helped reduce stroke, heart disease and other such vascular maladies, but within a few short weeks into the year 2006 the same establishment told us that those studies were all erroneous based on the evidence from even "newer studies."[555] For years men and women advanced in years were told to take calcium supplements to strengthen their bones, and once again the year 2006 brought us the sad news that science, true to form, took a wrong turn, since other "studies" found that taking calcium supplements not only doesn't strengthen the bones but increases the risk of other maladies. Where will it all end?[556]

The Changing Tide

So often we hear in the media of intellectuals in academia and the science community who ridicule those who take the Old and New Testaments at face value. With much ingratiating self-satisfaction they claim that literal interpretations of Scripture have been forever banished, since we have all come to accept that the Earth revolves around the sun. Once "biblical criticism" paved the way for scholars to ignore Scripture's testimony that the Earth had no movement, it was only a matter of time before the next biblical pillar – a six-day creation – would be attacked and suppressed, along with a global flood and the Genesis genealogies to the first man that stretched no longer than about 10,000 years.

Beginning around the mid-1900s, things began to change in the world of science. It was at this time that those who accepted Scripture both as divine revelation and at face value, began to delve more deeply into the sciences than ever before. They began to see that a proper interpretation of scientific facts did not preclude a non-evolutionary origin for the Earth or a

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ideas. So even if something is wrong with the paper, if they have the kernel of a novel idea, that's something to think about,' he says." (Journal: Public Library of Science Medicine, DOI: 10.1371/journal.pmed.0020124). See also: Richard Milton, *Forbidden Science: Exposing the Secrets of Suppressed Research*, 1994; Anthony Standen, *Science is a Sacred Cow*, 1952, 2000. Standen writes: "Physics is *not* a body of indisputable and immutable Truth; it is a body of well-supported probable opinion only, and its ideas may be exploded at any time" (p. 49).

[554] "Con Men in Lab Coats" *Scientific American*, March 2006, p. 10.

[555] "Low-Fat Diet Falls Short," *Science News*, February 11, 2006, vol. 169, p. 85.

[556] See also "Face up to fraud," Nature 481, 237-238, (19 January 2012); and "20 Things You Didn't Know about Science Fraud," Eric A. Powell, *Discover*, April 2012, p. 72.

non-uniformitarian development of its terrain, but actually supported it much better than the opposing evolutionary views. There has been so much information made available that we are beginning to see universities and secondary schools take a second look at these issues. For example, the Intelligent Design argumentation has proven itself to be one of the more formidable weapons against evolutionary theory in the ongoing wars of cosmogony. Of course, the opposition against creationism and catastrophism has mounted in proportion, since many of today's secular scientists refuse even to consider alternatives to their cherished atheistic evolutionary theories. As Oxford biologist Richard Dawkins put it: "Darwin made it possible to be an intellectually fulfilled atheist," or as Richard Lewontin admitted:

> It is not that the methods and institutions of science somehow compel us to accept a material explanation of the phenomenal world, but, on the contrary, that we are forced by our *a priori* adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counterintuitive, no matter how mystifying to the uninitiated. Moreover, that materialism is absolute, for we cannot allow a Divine Foot in the door.[557]

But *Galileo Was Wrong: The Church Was Right* does not address the arguments against evolution, *per se*. Many well-qualified secular and biblical scientists have done their job quite well in refuting its precarious tenets. Our book deals solely with the issue of Earth-centered cosmology, a subject that, unfortunately, many of the aforementioned biblical scientists have been somewhat reluctant to address, let alone support, for fear of appearing like the uneducated Neanderthals and stubborn academics that their evolutionary opponents accuse them of being.

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[557] "Billions and Billions of Demons," *The New York Review of Books*, January 9, 1997, pp. 28, 31. At the Salk Institute forum, Dawkins stated: "I am utterly fed up with the respect that we – all of us, including the secular among us – are brainwashed into bestowing on religion. Children are systematically taught that there is a higher kind of knowledge which comes from faith, which comes from revelation, which comes from scripture, which comes from tradition, and that it is the equal if not the superior of knowledge that comes from real evidence" (*New York Times*, Nov. 21, 2006).

Copernicus, Galileo, Kepler, Newton, Einstein, in Retrospect

In this chapter we have detailed the fraud and deception that often occurs in the scientific community. One facet of this deception is the suppression of historical facts about the personal lives of the world's renowned scientists. Their rejection of God and revelation are not in a vacuum. As we have seen from Gould to Sagan to Crick, their materialistic conclusions concerning the origins and function of the cosmos invariably affect the kind of lives they lead, and their biographies are often a sordid tale of pride and immorality. After forcefully releasing themselves from the motherly hand of the Church, scientists subsequently made themselves into icons of intellect and stamina that were bigger than life; 'men of renown' who took on an almost god-like quality, similar to the 'giants' who lived just prior to the Great Flood, and who also became the epitome of corruption and were eventually destroyed (Genesis 6:4-5). Interestingly enough, one scientist writing about Albert Einstein inscribed the words: "THERE WERE GIANTS IN THE EARTH IN THOSE DAYS" in the opening pages of his book.[558] The reality is, although these scientists are consistently revered in textbooks as the titans of humanity, history often tells quite a different story. In addition to the problems and anomalies in current science, the moral integrity of those who vied for its advancement was often at odds with convention, even by today's standards. We will limit our survey to just the prominent names associated with current Copernican cosmology: Copernicus, Kepler, Galileo, Newton and Einstein.

Nicolaus Copernicus Too Many Pagan Influences

Copernicus' personal life is not as well known as that of others who followed him, but we do know several disturbing things about him. In 1509, Copernicus published a translation of the obscenity-filled letters of the Byzantine poet, Simoncatta. Further sexual exploits came to light when it was discovered that Copernicus kept a mistress, but he refused to dismiss her when confronted by his diocesan bishop, Dantiscus. As one Copernican historian describes it:

> Doctor Nicolaus had a mistress who regularly visited his house….Sometime between July 1531 and the summer of 1538, Copernicus started receiving a woman at his curia in

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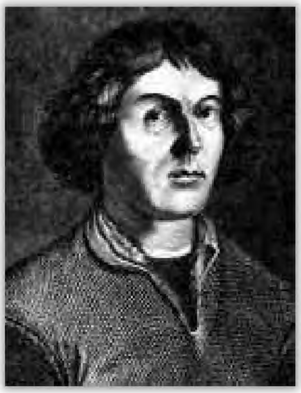
[558] Donald W. Rogers, *Einstein's Other Theory*, New Jersey, 2005.

> Frombork….The woman was named Anna Schilling…. Copernicus and Anna's father were involved together for seven years, from 1529 to 1536….Most problematic for Copernicus was the fact that she was still technically married….Anna was reported to be pretty, well educated, and deeply interested in astronomy…. Despite Dantiscus's order to clean his household, Copernicus did not comply…. Though everyone knew the actual situation between Copernicus and Anna, it appears that the astronomer told people that she was simply his housekeeper….Six weeks later the situation seemed to have been addressed when Copernicus wrote to Dantiscus…. However, Copernicus had lied. He had not ended the relationship, and word of the continued presence of Anna Schilling in Copernicus's house got back to Dantiscus later that winter….In his old age, almost at the end of his allotted time, he is still said to let his mistress in frequently in secret assignations.[559]



Having heard of his fame, a fellow heliocentrist, Georg Joachim Rheticus,[560] visited with Copernicus in 1539. After befriending Copernicus and reading his works, Rheticus worked very hard in convincing him to publish his *De revolutionibus*. Prior to Copernicus' decision, Rheticus wrote a summary version of Copernicus' work titled *Narratio prima* in

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[559] Jack Repcheck, *Copernicus's Secret*, pp. 92-99, 145.

[560] Rheticus' original name was Georg Joachim Iserin. His father, Georg Iserin, had been convicted of various crimes (either sorcery or theft, or both) and was executed. Families of the executed were required to change their last name. He chose "Rheticus" from the region of Rhaetia from where his mother originated.

1540.[561] It was Rheticus' purpose to do all that he could to disseminate the heliocentric universe. With the help of the Protestant publisher Johannes Petreius,[562] Rheticus acquired the services of Lutheran Andreas Osiander to write a preface for *De revolutionibus*. After years of labor, Rheticus was finally nearing success, but he did not get to see the final draft of *De revolutionibus* before it was published. In the meantime, Copernicus had suffered a stroke in December 1542, but his book was finally published in March 1543 by Petreius, and Copernicus had died shortly thereafter. After all the work that Rheticus had done to facilitate its publication, however, he received quite a shock when he read the opening credits of *De revolutionibus*. Koestler refers to it as a "double-cross." Repcheck describes it as follows:

> …when Rheticus opened the finished book…and finally read Copernicus's opening words [and] his acknowledgments, Rheticus must have been stunned to read that although Copernicus thanked several people, he somehow forgot to thank him. This had to have been a devastating blow to the young mathematician. Historians of science have been at pains to explain what happened…Giese wrote that "your teacher failed to mention you in his Preface to the treatise"….What happened?....It must have been something specific, because the oversight is glaring.[563]

Rheticus never really recovered from this slight, for many years afterward he refused to promote Copernicus' book. We might surmise that Copernicus was not in this cosmological pursuit solely as an altruistic venture for the truth, but for the fame that he so jealously desired to guard from any would-be usurper. Of course, Rheticus had his own problems, and perhaps Copernicus sensed something was amiss with the indulgent befriending he received from the young lad a few years earlier. As it turns out, Rheticus was a homosexual who, on several occasions, found himself being run out of town for his peccadilloes. On one occasion he was convicted of sodomy against a young boy. As Repcheck describes it:

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[561] Rheticus writes in the *Narratio*: "…each of the planets, by its position and order and every inequality of its motion, bears witness that the earth moves and that we who dwell upon the globe of the earth, instead of accepting its changes of position, believe that the planets wander in all sorts of motions of their own" (translated by Edward Rosen, in *Three Copernican Treatises*, 1971, p. 165).

[562] Petreius published works on Luther, Erasmus, Melanchthon, Henry VIII, Regiomontanus and Gasser. Although he also published a few works by Augustine, Calvin and Luther had commandeered some of Augustine's works on predestination for the cause of Protestantism.

[563] *Copernicus's Secret*, pp. 166-167. Repcheck goes on to speculate that "after Copernicus observed the acclaim bestowed on the *Narratio prima*, and after the young and enthusiastic Rheticus left Frombrok with his masterpiece, Copernicus might have sensed that he would not be around to enjoy the moment of victory, and Rheticus surely would. Perhaps this bothered him so much that he deliberately slighted Rheticus" (*ibid*).

> In April 1551, Hans Meusel, a merchant, brought a lawsuit against Rheticus for a shocking crime – the injunction claimed that the professor had "lured my son…plied him with strong drink, until he was inebriated; and finally did with violence overcome him and practice upon him the shameful and cruel vice of sodomy…Joachim Rheticus fled Leipzig immediately, leaving nearly all of his personal belongings behind…Over the next twelve months official letters were sent from the court to Rheticus and ignored. But on April 11, 1552, Rheticus, age thirty-eight, was found guilty of raping young Meusel. He was exiled from Leipzig for 101 years.[564]

In regard to his heliocentric theory, Copernicus consistently appealed to the "harmony" of his system, but it was a harmony ennobled by a sun that he personified, and, some say, deified. Copernicus writes:

> In the middle of all sits Sun enthroned. In this most beautiful temple could we place this luminary in any better position from which he can illuminate the whole at once? He is rightly called the Lamp, the Mind, the Ruler of the Universe: Hermes Trismegistus names him the Visible God, Sophocles' Electra calls him the All-seeing. So the Sun sits as upon a royal throne ruling his children the planets which circle round him. The Earth has the Moon at her service. As Aristotle says, in his *On Animals*, the Moon has the closest relationship with the Earth. Meanwhile the Earth conceives by the Sun, and becomes pregnant with an annual rebirth.[565]

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[564] *Ibid.*, p. 178. Koestler adds: "Rheticus was a sodomite" (*The Sleepwalkers*, p. 179, see also pp. 170f, 184f). Gingerich confirms with: "There were dark rumors of a drunken homosexual episode involving a student half his age. The irate father of the young man involved brought a lawsuit. In disgrace, Rheticus fled from Leipzig" (*The Book that Nobody Read*, p. 182).

[565] *De revolutionibus*, "10. Of the Order of the Heavenly Bodies," as cited in *The Copernican Revolution*, pp. 179-180 (Kuhn's translation from the Latin). Charles Glenn Wallis' translation (or his editor's), although similar, seems desirous to

Karl Popper shows the origin of these cultic ideas:

> Copernicus studied in Bologna under the Platonist Novara; and Copernicus' idea of placing the sun rather than the Earth in the center of the universe was not the result of new observations but of a *new interpretation* of old and well-known facts in the light of semi-religious Platonic and Neo-Platonic ideas. The crucial idea can be traced back to the sixth book of Plato's *Republic*, where we can read that the sun plays the same role in the realm of visible things as does the idea of the good in the realm of ideas. Now the idea of the good is the highest in the hierarchy of Platonic ideas. Accordingly the sun, which endows visible things with their visibility, vitality, growth and progress, is the highest in the hierarchy of the visible things in nature.…Now if the sun was to be given pride of place, if the sun merited a divine status…then it was hardly possible for it to revolve about the Earth. The only fitting place for so exalted a star was the center of the universe. So the Earth was bound to revolve about the sun. This Platonic idea, then, forms the historical background of the Copernican revolution. It does not start with observations, but with a religious or mythological idea.[566]

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lessen Copernicus' deification of the sun by using slightly different wording and lower case letters: "In the center of all rests the sun. For who would place this lamp of a very beautiful temple in another or better place than this wherefrom it can illuminate everything at the same time? As a matter of fact, not unhappily do some call it the lantern; others, the mind, the pilot of the world. Trismegistus calls it a 'visible god'; Sophocles' Electra, 'that which gazes upon all things.' And so the sun, as if resting on a kingly throne, governs the family of stars which wheel around. Moreover, the Earth is by no means cheated of the services of the moon; but as Aristotle says in the *De Animalibus*, the Earth has the closest kinship with the moon. The Earth moreover is fertilized by the sun and conceives offspring every year" (*On the Revolutions of Heavenly Spheres*, 1995, pp. 24-26).

[566] *Conjectures and Refutations: The Growth of Scientific Knowledge*, p. 187. Popper is referring to Dominicus Maria da Novara, a mathematician and astronomer in Italy. Indulging in a bit of anachronistic evaluation, Popper goes on to defend him, suggesting that even though Copernicus' idea came before the observation, he was nevertheless correct and "not a crank." More of Popper's *a-posteriori* thinking appears later in the book: "The Copernican system, for example, was inspired by a Neo-Platonic worship of the light of the Sun who had to occupy the 'centre' because of his nobility. This indicates how myths may develop testable components. They may, in the course of discussion, become fruitful and important for science" (*ibid.*, p. 257).

Popper, being a supporter of the heliocentric revolution, couches his critique of Copernicus in rather polite terms, but essentially he is saying that Copernicus' brainchild had all the earmarks of originating from pagan sun-worship. As Wolfgang Smith notes:

> …in the Renaissance movement championed by Marsiglio Ficino, the doctrine came alive again, but in a somewhat altered form; one might say that what Ficino instituted was indeed a religion, a kind of neo-paganism. Copernicus himself was profoundly influenced by this movement, as can be clearly seen from numerous passages in the *De revolutionibus*.[567]

Upon reading *De revolutionibus*, one is struck by the preponderance of philosophical and humanistic arguments Copernicus brings to his aid. As J. D. Bernal notes: "[Copernicus'] reasons for his revolutionary change were essentially philosophic and aesthetic," and in a later edition he is more convinced that the "reasons were mystical rather than scientific."[568] Overall, Copernicus presents about five-dozen arguments, at least half of which are solely philosophical in nature. Although the other half of his argumentation depends more on mechanics, these also have philosophical appendages to them. Very few of his arguments are based on his own personal observations, since, as we noted earlier, Copernicus merely reworked the observations of his Greek predecessors. In fact, Copernicus concludes that, because the Greeks did not detail their cosmological models more thoroughly, history (and God) have called upon him to provide the long-awaited documentation of true cosmology.[569]

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[567] Wolfgang Smith, *The Wisdom of Ancient Cosmology*, p. 174. Copernicus was also influenced heavily by the liberal humanist, Codrus, who was known for denying various Church doctrines.

[568] J. D. Bernal, *Science in History*, 1st edition, London, Watts, 1954; 2nd edition, 1965. Cited in Lakatos, *Methodology of Scientific Research Programmes*, p. 129.

[569] Thomas Heath sheds more light on this connection: "Copernicus himself admitted that the [heliocentric] theory was attributed to Aristarchus, though this does not seem to be generally known….But it is a curious fact that Copernicus did mention the theory of Aristarchus in a passage which he afterwards suppressed: 'Credibile est hisce similibusque causis Philolaum mobilitatem terrae sensisse, quod etiam nonnulli Aristarchum Samium ferunt in eadem fuisse sentential.'" Heath also shows by quotes from Plutarch and Archemides that Aristarchus was the originator of the heliocentric view (Thomas Heath, *Aristarchus of Samos: The Ancient Copernicus*, 1913, p. 301ff). J. L. E. Dreyer provides a more readable translation of Archimedes' words: "You know that according to most astronomers the world (κόσμος) is the sphere, of which the center is the center of the earth, and whose radius is a line from the center of the earth to the center of the sun. But

This brings us to another disturbing aspect of Copernicus' approach to cosmology. Since Copernicus was a Canon of the Catholic Church and one who rubbed shoulders with high-placed Cardinals and enjoyed audiences with the reigning pope, one might expect him to have been a high churchman in his own right, with regular recourse to the Church Fathers, especially since he knew that a good number of them wrote definitive works on cosmology and cosmogony.[570] Moreover, one would also expect him to have sought out their consensus on important issues, since this was the Church's most formidable weapon against erroneous ideas, even as Robert Bellarmine admonished Foscarini and Galileo.[571] But one searches in vain for any patristic references in *De revolutionibus*, or, for that matter, in any of Copernicus' works. After prefacing his remarks to Pope Leo X with a castigation of those who "…although wholly ignorant of mathematics… shamelessly distorting the sense of some passage in Holy Writ to suit their own purpose," the only time Copernicus

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Aristarchus of Samos has published in outline certain hypotheses, from which it follows that the world is many times larger than that. For he supposes (ὑποτιθέται) that the fixed stars and the sun are immovable, but that the earth is carried round the sun in a circle which is in the middle of the course…" (J. L. E. Dreyer, *History of the Planetary Systems from Thales to Kepler*, 1906, p. 136).

[570] Chief among them were **Basil the Great**, bishop of Caesarea. Advancing a dogmatic assertion of geocentrism, he writes: "There are inquirers into nature who with a great display of words give reasons for the immobility of the Earth....Do not then be surprised that the world never falls: it occupies the center of the universe, its natural place. By all necessity it is obliged to remain in its place, unless a movement contrary to nature should displace it. If there is anything in this system which might appear probable to you, keep your admiration for the source of such perfect order, on the wisdom of God" (*Hexameron*, Homily 1, 10); and **Chrysostom**: "For they who are mad imagine that nothing stands still, yet this arises not from the objects that are seen, but from the eyes that see. Because they are unsteady and giddy, they think that the Earth turns round with them, which yet turns not, but stands firm. The derangement is of their own state, not from any affection of the element." (*Homilies on Titus* 2:1).

[571] Bellarmine states: "Second, I say that, as you know, the Council [of Trent] prohibits interpreting Scripture against the common consensus of the Holy Fathers; and if Your [Reverence] wants to read not only the Holy Fathers, but also the modern commentaries on Genesis, the Psalms, Ecclesiastes, and Joshua, you will find all agreeing in the literal interpretation that the sun is in heaven and turns around the earth with great speed, and that the earth is very far from heaven and sits motionless at the center of the world. Consider now, with your sense of prudence, whether the Church can tolerate giving Scripture a meaning contrary to the Holy Fathers and to all the Greek and Latin commentators" (Bellarmine to Paolo Antonio Foscarini, April 12, 1615).

crosses the threshold into the patristic witness for Leo's sake is a derisive remark about Lactantius:

> For it is not unknown that Lactantius, otherwise a distinguished writer but hardly a mathematician, speaks in an utterly childish fashion concerning the shape of the Earth, when he laughs at those who have affirmed that the Earth has the form of a globe.[572]

Consequently, as a lot, the Fathers are made to appear as ignorant partisans against the goals of science and not worthy of comment on so important a subject. The reality is that Lactantius was the only Father of the Church (and he was not a highly esteemed patristic witness) who held to the idea of a non-spherical Earth.[573] Every other Father who wrote at length on cosmological issues stated his belief, based on Scripture and science, that the Earth was a sphere.[574] But one would never know these essential facts from the biased Copernicus. Instead, Copernicus rests his lot with the Greek philosophers and astronomers, the very individuals upon whom the Church Fathers focused their critiques in the areas of cosmology and cosmogony. *De revolutionibus* is saturated with nothing but praise for the Greek cosmologists, the ones who advocated a moving Earth:

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[572] *De revolutionibus*, Dedication to Pope Paul III, *Revolutions of Heavenly Spheres*, Charles G. Wallis, p. 7.

[573] Lactantius, *Divine Institutes*, Bk 3, Ch 23: "they thought that the world is round like a ball…But if this were so, the Earth also itself must be like a globe…And if this were so, that last consequence also followed, that there would be no part of the Earth uninhabited by men and the other animals. Thus the rotundity of the Earth leads, in addition, to the invention of those suspended antipodes."

[574] **Athanasius**: "And wells, again, and rivers will never exist without the Earth; but the Earth is not supported upon itself, but is set upon the realm of the waters, while this again is kept in its place, being bound fast at the center of the universe. And the sea, and the great ocean that flows outside round the whole Earth, is moved and borne by winds wherever the force of the winds dashes it." (*Against the Heathen*, First Book, Part 1, 27); **Gregory of Nyssa**: "As, when the sun shines above the Earth, the shadow is spread over its lower part, because its spherical shape makes it impossible for it to be clasped all round at one and the same time by the rays, and necessarily, on whatever side the sun's rays may fall on some particular point of the globe…" (*On the Soul and the Resurrection*); **Augustine**: "Think we, had he ascended to the peak of some very high and pointed mountain, and looked out thence and seen the compass of the Earth, and the circles of the round world, and therefore said, 'I have seen the end of all perfection'"? (*Homilies on First John*, x, 5); **Jerome**: "…the sphere which I have called motionless and all that it contains will be dissolved into nothing, and the sphere in which the antizone itself is contained shall be called 'good ground,' and that other sphere which in its revolution surrounds the Earth and goes by the name of heaven shall be reserved for the abode of the saints" (*Letters*, 124, *To Avitus*).

> I found in Cicero that Hicetas [of Syracuse, fifth century B.C.] had realized that the Earth moved. Afterwards I found in Plutarch that certain others had held the like opinion. I think fit here to add Plutarch's own words, to make them accessible to all: "The rest hold the Earth to be stationary, but Philolaus the Pythagorean says that she moves around the [central] fire on an oblique circle like the Sun and Moon. Heraclides of Pontus and Ecphantus the Pythagorean also make the Earth to move, not indeed through space but by rotating round her own center as a wheel on an axle from West to East.[575]

In the text of *De revolutionibus* he continues:

> It is the vault of Heaven that contains all things, and why should not motion be attributed rather to the contained than to the container, to the located than the locater? The latter view was certainly that of Heraclides and Ecphantus the Pythagorean and Hicetas of Syracuse (according to Cicero). All of them made the Earth rotate in the midst of the Universe…That the Earth, besides rotating, wanders with several motions and is indeed a Planet, is a view attributed to Philolaus the Pythagorean, no mean mathematician, and one whom Plato is said to have sought out in Italy.[576]

We see that, despite the fact that the Greeks have quite a confusing assortment of views on the cosmos, Copernicus is still enamored with their cosmologies, and especially with their mathematics, but he holds dear only the select few who believed in heliocentrism. As we have noted earlier, the appeal to "mathematics" or "mathematical harmonies" is a common thread running through most of the new cosmology, from Copernicus to Kepler through Einstein and Quantum Mechanics. The appeal, though appearing logical and formidable, is baseless. Mathematics proves very little, except that the right side of the equation often equals the left side.

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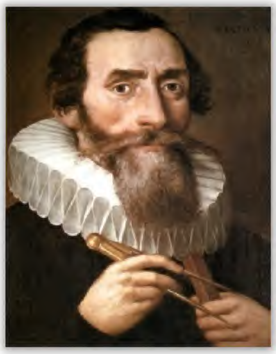
[575] *De revolutionibus*, Dedication to Pope Paul III. Heraclides (d. 310 BC) a Greek astronomer who was one of the first to propose that the revolution of the stars around the Earth could also be understood as the Earth rotating on its axis in the midst of stationary stars.

[576] *De revolutionibus*, 5. *Whether Circular Motion Belongs to the Earth; and Concerning its Position.*

Johannes Kepler
Suspected of Murdering the Geocentrist, Tycho Brahe



Kepler, although a Lutheran, was heavily influenced by the occult, as was his mother, Katherina Kepler, and the latter's endeavor may have led to her trial as a witch.[577] Following his particular philosophy, Kepler's main motivation for bringing the sun into the center of the planetary system, as had Copernicus before him, was that he considered it worthy of symbolic deification. In one passage he describes the sun as: "Who alone appears, by virtue of his dignity and power, suited…and worthy to become the home of God himself, not to say the first mover."[578]

Much more disturbing, however, is another facet to Kepler's life that has been hidden from the eyes of the world for the last four hundred years. Although most historians were aware of Kepler's nefarious inclinations wherein jealousy and ambition ruled his motives, few were prepared for what recent forensic evidence has revealed. Whereas most scholars had thought Kepler's employer, the renowned Tycho de Brahe, died of a urinary tract infection, an exhumation of his body leading to a chemical analysis of his hair shows lethal levels of mercury poisoning just hours before his death.[579] Kepler, already steeped in the Copernican theory that he freely wielded in his Lutheran circles with little reproach, desperately needed Brahe's forty-years' worth of planet- and star-charting to bring his "*Mysterium Cosmographicum*" visions to fruition. As Kepler describes it:

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[577] *Kepler's Witch*, James A. Connor, 2004, pp. 275-307. *The Sleepwalkers*, pp. 389-393. The woman relative who raised Katherina was executed for practicing witchcraft (John Lear, *Kepler's Dream*, 1965, p. 31).

[578] *On the Motion of Mars*, Prague, 1609, Chapter 4, as cited in Thomas S. Kuhn, *The Copernican Revolution*, 1959, p. 214. Kuhn notes: "This symbolic identification of the sun and God is found repeatedly in Renaissance literature and art" (*ibid*., p. 130). Later adding: "This conviction [of Kepler's], together with certain intrinsic incongruities discussed above, was his reason for rejecting the Tychonic system" (*ibid*., p. 214). Kepler's reference to the "first mover" encapsulates his concept that as the sun rotated on its axis, its rays would act like a brush to move the planets.

[579] Joshua Gilder and Anne-Lee Gilder, *Heavenly Intrigue: Johannes Kepler, Tycho Brahe, and the Murder Behind one of History's Greatest Scientific Discoveries*, 2004, pp. 145, 206-234. After several of Kepler's plots to confiscate

> For among the most powerful causes of visiting Tycho was this also, that I might learn the truer proportions of the deviations [of the planets] from him, by which I might examine both my *Cosmic Mystery* and *The Harmony of the World*. For these *a priori* speculations ought not to impinge on clear experience: but with it be reconciled.[580]

How valuable were these charts and data? Without them Kepler would have been just another seventeenth-century astronomer struggling to make a living by reading astrological horoscopes, for he would have had little evidence upon which to base his theory regarding the motions of the planets. Modern telescopic observation reveals that, without ever using a telescope, Brahe's data of stars was consistently accurate to within 1 minute of arc or better. His observations of planetary positions were reliable to within 4 minutes of arc, which was more than twice the accuracy produced by the best observers of antiquity. In fact, it was Tycho's express desire to use his precise measurements to uncover the errors in Copernicus' solar system. This data was absolutely priceless, and Kepler, who revered Tycho and called him *The Phoenix of Astronomy*, would eventually pay, the evidence shows, the ultimate price to obtain them. Tycho knew of Kepler's intention to acquire the charts, but Tycho wouldn't budge since he was the staunchest anti-Copernican of his day. Tycho's very first letter to Kepler outlined his express desire that his forty-years of painstaking work be used to promote the geocentric system. In his book published in 1588, *De mundi aetherei recentioribus phaenomenis*, he stated his devotion to Scripture and to geocentrism:

Brahe's records were foiled (pp. 188-194) the ultimate plot was hatched. Kepler, having become familiar with Brahe's alchemical laboratory, knew the precise dosage of mercuric chloride solution that would initiate the onset of Brahe's demise. PIXE analysis [particle-induced X-ray emission] has confirmed the presence of the lethal levels of residual mercury and calcium, the latter originating from the milk was used to camouflage the poison – a favorite medium for poison in those times.

[580] *Heavenly Intrigue*, p. 154. The Gilders' add: "Kepler had not forgotten Brahe's advice; he understood that, without the empirical backing only Brahe's incomparable observations could provide, his idea of universal structure and harmony would never amount to anything but an elegant theory" (*ibid*).

> What need is there, without any justification, to imagine the earth, a dark dense and inert mass, to be a heavenly body undergoing even more numerous revolutions than the others, that is to say, subject to triple motion, in violation not only of all physical truth but also of the authority of Holy Scripture, which ought to be paramount.[581]

Tycho had more than a suspicion that Kepler saw things very differently. In the words of one author:

> Kepler knew that in Tycho's possession were the raw observations that he, as "architect," longed to assemble into a coherent picture of planetary motion. And Tycho knew that the gifted Kepler had the mathematical wherewithal to prove the validity of the Tychonic [geocentric] system of the heavens. But Kepler was a confirmed Copernican; Tycho's model had no appeal to him, and he had no intention of polishing this flawed edifice to the great man's ego.[582]

As the plot thickens, Kepler tells his diary:

> Let all keep silence and hark to Tycho who has devoted thirty-five years to his observations… For Tycho alone do I wait; he shall explain to me the order and arrangement of the orbits… Then I hope I shall one day, if God keeps me alive, erect a wonderful edifice.[583]

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[581] Cited in Repcheck's *Copernicus's Secret*, p. 187.

[582] Alan W. Hirshfeld, *Parallax: The Race to Measure the Universe*, 2001, pp. 92-93. Brahe was the principal author but perhaps not the only one who discovered what we now know as the Tychonic system. Helisaeus Roeslin worked on a similar system, but his work was never published. Nicholas Reimers Bär (also known as Ursus), published a Tychonic system with a rotating Earth in the *Fundaments of Astronomy* [actual title: *Nicolai Raimari Ursi Dithmarsi Fundamentum astronomicum*, Strasburg, 1588] but was known to have stolen it from Brahe, whereupon Brahe sought litigation against him, but Ursus died before the trial [see *Heavenly Intrigue*, pp. 120-185].

[583] Letter to Michael Maestlin, February 16, 1599, *Gesammelte Werke*, vol. xiii, p. 289 *seq*. (cited in *The Sleepwalkers*, p. 280). Koestler adds: "With one eye he was reading the thoughts of God; the other squinted enviously at Tycho's shining armillary spheres. But Tycho refused to publish his observations until he had completed his own theory. He jealously guarded his treasure, volumes of figures, the result of a lifetime of work."

> Brahe may discourage me from Copernicus (or even from the five perfect solids) but rather I think about striking Tycho himself with a sword…I think thus about Tycho: he abounds in riches, which like most rich people he does not rightly use. Therefore great effort has to be given that we may wrest his riches away from him. We will have to go begging, of course, so that he may sincerely spread his observations around.[584]

Scheming to come into Brahe's company, Kepler finally met him on February 4, 1600. Tycho put Kepler to work crunching numbers in the hopes of

> …turning his Tychonic system from a rough schematic diagram of the heavens into an accurate model from which exact predictions of planetary motion could be made…the Tychonic system – which Kepler, as a Copernican, disdained.[585]

As Kepler describes the toil:

> I would have brought my discussion about the *Harmony of the World* long ago to an end except that the Astronomy of Tycho occupied me so totally that I almost was insane.

Just eighteen months later, Brahe, the epitome of perfect health, suddenly died. All the evidence points the finger at Kepler. With his usual knack for introspective understatements, Kepler tells his diary:

> I confess that when Tycho died, I quickly took advantage of the absence, or lack of circumspection, of the heirs, by taking the observations under my care, or perhaps usurping them…"[586]

The rest is history, as they say, but it is filled with enough intrigue to make even Agatha Christie envious of the story line.[587]

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[584] Letter to Michael Maestlin, February 16 1599, *Gesammelte Werke*, vol. xiii, p. 289 *seq*. Partially translated from the Latin by the Gilders, *Heavenly Intrigue*, p. 132.

[585] *Heavenly Intrigue*, p. 157.

[586] Letter to D. Fabricius, February 1604, *Gesammelte Werke,* vol. xv, p. 231 *seq*., *The Sleepwalkers*, p. 350.

[587] See the most recent article in the New York Times at http://www.nytimes.com/2010/11/30/science/30tierney.html?pagewanted=all

Kepler's Interpretation of the Bible

As would be the case with Galileo the Catholic, Kepler the Lutheran felt the need to justify his heliocentric views against the geocentrism of the Bible. Similar to Galileo, Kepler dismissed the Bible's language as merely phenomenal. He writes:

> …astronomy discloses the causes of natural phenomena and takes within its purview the investigation of optical illusions. Much loftier subjects are treated by Holy Writ, which employs popular speech in order to be understood. Within this framework and with a different purpose in view, only in passing does the Scripture touch on the appearances of natural phenomena as they are presented to sight, whence human speech originated, and proceed to do so even though it was perfectly clear to everyone that optical illusions are involved. Not even we astronomers cultivate astronomy with the intention of altering popular speech. Yet while it remains unchanged, we seek to open doors of truth. That the planets are stationary or retrogress; the sun stands still, turns back, rises, sets, goes forth from one end of heaven like a bridegroom coming out of his chamber and goes down into the other end, mounts to the midst of heaven, moves against certain valleys and mountains – these expressions are used by us along with laymen, that is, with the visual sense, even though not one of these locutions is literally true, as all astronomers agree.[588]

We will address both Kepler and Galileo's treatment of Scripture in Chapter 12. Suffice it to say, Kepler, as all heliocentric astronomers who must deal with the Bible, has misrepresented and misconstrued the teaching of Scripture.

Galileo Galilei: The Rebel Turned Repentant

Galileo followed right on the heels of Kepler. Like Kepler, he had an eccentric and irascible personality, at least up until the last years of his life. But whereas Kepler was more reserved, the unconverted Galileo was the quintessential know-it-all, always and everywhere trying to outshine everyone who crossed his path. As Koestler sees him:

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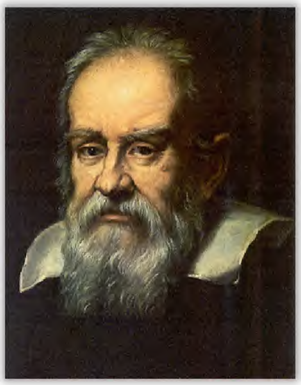
[588] Johannes Kepler, *Epitomie Astronomie Copernicanae*, Book I. It was the *Epitomie* that would eventually be put on the *Index of Forbidden Books* by Pope Alexander VII.

> Galileo had a rare gift of provoking enmity; not the affection alternating with rage which Tycho aroused, but the cold, unrelenting hostility which genius plus arrogance minus humility creates among mediocrities.[589]



Historian A. C. Custance adds:

> Judging by Galileo's correspondence and other records of his opinion of himself he was fantastically selfish intellectually and almost unbelievably conceited. As an illustration of the former there is the now well-known fact that he refused to share with his colleagues or with acquaintances such as Kepler any of his own findings or insights; he actually claimed to be the only one who ever would make any new discovery![590]

By the same token, Galileo would ignore the overtures of his colleagues but steal secrets behind their backs. Kepler was alerted to this fact when one of his admirers wrote to him and said: "Galileo has your book and teaches your discoveries as his own…" but which Kepler, for reasons of his own, allowed him to do so without litigation.[591] In fact, Kepler sought Galileo's written correspondence on many occasions. In one instance he sent Galileo his magnum opus, *Mysterium Cosmographicum*, hoping for a review, but Galileo ignored all but two inquiries from Kepler, and those responses were separated by thirteen years. The second response was prompted by nothing less than a threat from Kepler to expose Galileo as a fraud unless he produced the evidence of his telescope sightings about which he had been continually bragging.

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[589] *The Sleepwalkers*, p. 373.

[590] A. C. Custance, "The Medieval Synthesis and the Modern Fragmentation of Thought," in *Science and Faith*, p. 153.

[591] *The Sleepwalkers*, p. 365.

Among his other braggadocios, Galileo claimed to have invented the telescope, but Kepler and his colleagues knew it was available twenty years earlier from one of Galileo's countrymen, Giovanni Della Porta. Records also show that spectacle-maker Johann Lippershey possessed a license to make telescopes by the mid-1580s. By April 1609 one could buy a telescope from shops in Paris, the same year Galileo published that he was the first to see the moons of Jupiter, a claim which is also in doubt since there is evidence that other observations of Jupiter preceded Galileo's, and that Galileo's telescope was so small and clumsy it would have been hard to see Jupiter itself, much less its moons.[592] When Kepler pressed him to send the telescope so that his claims could be verified, Galileo gave him the typical 'the-dog-ate-it' excuse, claiming that he had "lent it to the Grand Duke for exhibition."

Still, Galileo managed to have himself become the celebrated discover of Jupiter's moons. The Jesuits of the Roman College set aside a day of ceremonies in his honor, and he was invited to a personal audience with Pope Paul V. Galileo followed this by naming the moons the "Medicean Stars" in honor of the Medici family who were the financial barons of Italy. Having previously dabbled in astrology, Galileo wrote a personal horoscope for Cosimo Medici, the Grand Duke of Tuscany, stating: "It was Jupiter, I say, who at your Highness' birth…looked down upon your most fortunate birth."[593] Cosimo promptly elevated Galileo to the position of chief mathematician and philosopher, whereupon he received a salary of 1,000 florins a year, and was thus financially secure for the rest of his life. In his usual lack of gratitude, Galileo rarely mentions Kepler's name in his books, and even those occasions are with the intent to refute him. It is no surprise that Galileo rejected Kepler's three laws of planetary motion as well as his discoveries in optics. Not surprisingly, the unconverted Galileo thought he had a better idea. To one of his other rivals Galileo stated:

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[592] Ernst Zinner, *Entstehung und Ausbreitung der Copernicanischen Lehre* (Erlangen, 1943), p. 345, cited in *The Sleepwalkers*, pp. 372-374. Various unverified stories are circulated about the unwillingness of various people to accept Galileo's sighting of Jupiter's moons, such as Cesare Cremoni and Giulio Libri, professors of philosophy at Padua and Pisa, respectively, and Christoph Clavius who is purported to have said that the moons were a trick of Galileo's telescope lenses. See Paul Feterabend's extensive treatment of this issue and the matter of Galileo's alleged invention of the telescope in *Against Method*, pp. 81-93.

[593] *The Book that Nobody Read*, pp. 200-201.

> You cannot help it, Mr. Sarsi [*i.e.*, Grassi] that it was granted to me alone to discover all the new phenomena in the sky and nothing to anybody else. This is the truth which neither malice nor envy can suppress."[594]

His self-appointed monopoly on the sky is probably why Galileo also claimed to be the first to discover sunspots, but the records show that the Jesuits Johannes Farricius and Christopher Scheiner and his assistant Cysat had found the spots much earlier, both of whom had published their findings separately, many months before Galileo.

Galileo's deceit reached new heights in his confrontations with the Church's Holy Office from 1616-1633. Prior to this, Galileo had made known his views of heliocentrism privately in a 1597 letter to Kepler:

> I have already for many years come to accept the Copernican opinion and with this hypothesis have been able to explain many natural phenomena, which under the current hypotheses remain unexplainable.[595]

Yet in his characteristic duplicity, in the intervening years between 1597 and up until 1613, he had been teaching against Copernicanism quite vigorously, complete with charts and graphs. A 1601 manuscript of his musings still survives today.[596] Galileo was in a constant whirlwind: saying one thing and doing another, and doing one thing and saying another. Suffice it to say, after the Church gave him every grace and favor to treat Copernicanism as a hypothesis, not fact, Galileo refused to comply, claiming he had proof when, indeed, he had none at all. The Church hierarchy simply could not put up with his roguery any longer. His former confidant, Cardinal Barberini, later became Urban VIII, and, as pope, made it a point to condemn Galileo for lack of proof. Urban upheld the 1616 Sacred Congregation's verdict of "formal heresy" for Copernicanism and "vehemently suspect of heresy" for Galileo after obtaining Galileo's renunciation in 1633. He sent notice of the condemnation to all the inquisitors and papal nuncios of Europe, making it an official proclamation of the Vatican.[597]

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[594] *The Sleepwalkers*, p. 436. Taken from Galileo's 1623 book titled *Il Saggiatore* (*The Assayer*). The book starts with a tirade against his opponents: "Others, not wanting to agree with my ideas, advance ridiculous and impossible opinions against me; and some, overwhelmed and convinced by my arguments, attempted to rob me of that glory which was mine, pretending not to have seen my writings and trying to represent themselves as the original discoverers of these impressive marvels" ("The Assayer," *Theories and Opinions of Galileo*, translated by Stillman Drake 1957, p. 274).

[595] *Le Opere di Galileo Galilei*, Vol. 10, p. 68.

[596] *Trattato della Sfera*, Florence, Opere, Ediz. Nationale, Vol. II, 1929, pp. 203ff. Galileo said the Earth did not move, since if it did, the clouds could not keep up with it. Klaus Fischer surmises that often Galileo doubted the Copernican system, since he knew he had no solid proof (*Galileo Galilei*, p. 94).

Galileo never married but he fathered two illegitimate daughters and one son between the years of 1600 and 1606 with his long-time mistress, Marina Gamba of Venice, whom he eventually abandoned. In light of his immorality, the unconverted Galileo was hardly the example of a devout Catholic. Although Galileo took his children with him to Florence, he soon found caring for them to be very annoying and he decided to send the daughters to an impoverished convent in Arcetri because of what one historian calls his "irrepressible egotism"[598] that led him to abandon them. The older daughter was baptized as Virginia and adopted the name Maria Celeste when taking her vows as a nun. She was very close to Galileo and had much correspondence with him. At her death in 1634 (a year after Galileo's trial) Galileo became very despondent. She was chosen to read to Galileo the daily penitential Psalms imposed upon him in exile by Pope Urban VIII. The other daughter, Livia, who took the name Arcangela at the convent, maintained her animosity toward him for the rest of his life. The son, Vincenzio, was legitimized by Galileo's former student and now Grand Duke of Tuscany, Cosimo Medici.

All things considered, the unconverted Galileo was probably one of history's better examples of a sophist and propagandist. Although his image is one of an empiricist who made no claims apart from experiment, Galileo often gloried in credit where no credit was due. Arthur Koestler, helps reveal the man behind the image:

> The personality of Galileo, as it emerges from works of popular science, has even less relation to historic fact than Canon Koppernigk's…[H]e appears…in ration-alist mythography as the Maid of Orleans of Science, the St. George who slew the dragon of the Inquisition. It is, therefore, hardly surprising that the fame

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[597] As Dorothy Stimson reports, "Pope Urban had no intention of concealing Galileo's abjuration and sentence. Instead, he ordered copies of both to be sent to all inquisitors and papal nuncios that they might notify all their clergy and especially all the professors of mathematics and philosophy within their districts…" (*The Gradual Acceptance of the Copernican Theory of the Universe*, 1917, pp. 67-68).

[598] As quoted in: *This Wild Abyss: The Story of the Men Who Made Modern Astronomy*, Gail E. Christianson, 1978, p. 272.

> of this outstanding genius rests mostly on discoveries he never made, and on feats he never performed. Contrary to statements in even recent outlines of science, Galileo did not invent the telescope; nor the microscope; nor the thermometer; nor the pendulum clock. He did not discover the law of inertia; nor the parallelogram of forces or motions; nor the sun spots. He made no contribution to theoretical astronomy; he did not throw down weights from the leaning tower of Pisa and did not prove the truth of the Copernican system. He was not tortured by the Inquisition, did not languish in its dungeons, did not say 'eppur si muove'; and he was not a martyr of science.[599]

The most egregious fact about the unconverted Galileo is that at the time he was vigorously defending Copernicanism before the Holy Office in 1633, he knew *even then* the system didn't work and that he had no substantial proof for it. Since he rejected Kepler's elliptical orbits,[600] and refused any compromise with the Jesuits who were going over to Brahe's geocentric model,[601] he was stuck with Copernicus' forty-eight epicycles, yet he advertised the model as one that bypassed the earlier mechanical problems "with one single motion of the Earth."[602] It is obvious that either Galileo was lying or he never read Copernicus' book, which is one of the reasons Koestler refers to Copernicus' work as "The book that nobody read." Even Owen Gingerich, who disagrees with Koestler's general assessment that Copernicus' book was unread, agrees that Galileo didn't read it.[603] Calling his bluff, Robert Bellarmine stated quite clearly to Galileo that the Church would not even consider changing its position on the cosmos unless Galileo could provide proof of his claims. In one of his more audacious moves, Galileo tried to prove his case by a strange

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[599] *The Sleepwalkers*, p. 358. Koestler adds, however, that Galileo discovered that a pendulum swings at constant frequency, regardless of amplitude, and that he invented the pulsilogium, a timing device for taking pulses, and the thermoscope, a forerunner of the thermometer (pp. 359-360). Regarding the experiment on falling bodies, I. Bernard Cohen states that Galileo's conclusion "only shows how firmly he had made up his mind before hand, for the rough conditions of the experiment would never have yielded an exact law" (*Lives in Science*, 1957, p. 14). Some admirers even revise Galileo's words to conform to the empiricist image. Broad and Wade point out Alexandre Koyré's discovery that an author added the phrase "by experiment" to Galileo's original wording: "Nevertheless, I have discovered *by experiment* some properties of it which are worth knowing and which have not hitherto been observed or demonstrated" ("Traduttore-Traditore. A Propos de Copernic et de Galilée," *Isis*, 34, 209-210, 1943; *Metaphysics and Measurement: Essays in Scientific Revolution*, 1968). They continue: "With Galileo, the desire to make his ideas prevail apparently led him to report experiments that could not have been performed exactly as described…The Renaissance saw the flowering of Western experimental science, but in Galileo, the propensity to manipulate fact was the worm in the bud" (*Betrayers of the Truth*, p. 27).

[600] Kepler tried in many instances to establish a correspondence with Galileo, but Galileo remained quite aloof, thinking he had a better answer to cosmology. He used Kepler's material, however, whenever it was to his advantage, and claimed it as his own.

[601] Koestler writes: "Jesuit Father Horatio Grassi of the *Collegium Romanum*…quoted with approval Tycho's conclusions…a further step in the Jesuits retreat from Aristotle…and a further sign of the Order's implicit

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endorsement of the Tychonic system" (*The Sleepwalkers*, pp. 473-474). In 1619, Grassi wrote *The Astronomical and Philosophical Balance* in support of the Tychonic system, and Galileo answered with *Il Saggiatore* (The Assayer) in 1623, which, in his usual sardonic manner, calls Brahe's 40-years worth of planet-charting mere "alleged observations" and, not believing in comets himself, assigns them the title "Tycho's monkey-planets." He berates Grassi with epithets such as "piece of asininity," "buffoon," "evil poltroon," and "ungrateful villain." De Santillana adds that some of Galileo's favorites were "mental pygmies," "dumb mooncalves" and "hardly deserving to be called human beings." In all of history, only Martin Luther surpasses Galileo in the category of producing the most caustic vitriol against his opponents.

[602] As quoted from the third day of arguments in *Dialogue on the Flux and Reflux of the Tides*, also known from the title that Pope Urban preferred: *The Dialogue on the Two Great World Systems*. Koestler adds: "The third day is concerned with the astronomical arguments for and against Copernicus, and here Galileo is downright dishonest…that to 'save' the planets' apparent stations and retrogressions, Ptolemy had to introduce 'very great epicycles' which Copernicus was able to dispense 'with one single motion of the Earth.' But he breathes not a word about the fact that Copernicus, too, needs a whole workshop full of epicycles; he keeps silent about the eccentricity of the orbits, the various oscillations and librations, the fact that the sun is neither in the center of the motions, nor lies in their plane; in a word, he deliberately evades the real problems of astronomy which had started Tycho and Kepler on their quest….Moreover, he keeps silent about the fact that the Tychonic system fits the phenomena equally well.…He employs his usual tactics of refuting his opponent's thesis without proving his own; in this case not by sarcasm, but by confusing the issue" (*The Sleepwalkers*, pp. 483-485).

[603] After seeing hardly any annotations in Galileo's personal copy of Copernicus' *De Revolutionibus*, Gingerich notes: "I had long supposed that Galileo was not the sort of astronomer who would have read Copernicus' book to the very end. Even…when we had speculated how few early readers of *De Revolutionibus* there might have been, we had been reluctant to include Galileo in the list of readers. Unlike Reinhold or Maestlin or Kepler, he was not interested in the details of celestial mechanics" (*The Book that Nobody Read*, p. 200).

concoction of theory and conjecture on the nature of tidal action. Having rejected as "occultish" Kepler's explanation that the combination of the sun's and moon's gravity caused the daily tides, Galileo, even knowing that his own explanation could not be physically possible, nevertheless, to save his prestige, tried to convince the Catholic prelates that tides were caused by the tilt of the Earth's axis and the Earth's monthly changes in orbital velocity. In addition, his theory addressed only a 24-hour tidal cycle, but sailors knew, and reported to the common folk, that the tides alternated every 12 hours, creating two tides per day. Galileo then tried to explain the discrepancy by postulating that the ocean floor varied in depth. No wonder Koestler concludes his remarks with:

> There can be no doubt that Galileo's theory of the tides was based on unconscious self-deception…. Making the complexities of Copernicus appear deceptively simple, was part of a deliberate strategy, based on Galileo's contempt for the intelligence of his contemporaries. We have seen that scholars have always been prone to manias and obsessions, and inclined to cheat about details; but impostures like Galileo's are rare in the annals of science.[604]

Identical to Copernicus, Galileo was enamored with circles, and if something did not fit into that mold, it was eliminated. As Feyerabend notes:

> Galileo's circular law is not the right dynamics. It fits neither the epicycles which still occur in Copernicus, nor Kepler's ellipses. In fact, it is refuted by both. Still, Galileo regards it as an essential ingredient of the Copernican point of view and tries to remove bodies, such as comets, whose motion quite obviously is not circular, from interplanetary space. In his Assayer "Galileo talked about comets [and interpreted them as illusions, similar to rainbows] in order to protect the Copernican system from possible falsifications."[605]

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[604] *The Sleepwalkers*, p. 486. See also W. R. Shea and M. Artigas, *Galileo in Rome: The Rise and Fall of a Troublesome Genius*, 2003.

[605] *Against Method*, p. 77, n. 1, quoting Redondi's *Galileo Heretic*, pp. 145, 31. Feyerabend later adds: "An example of backward movement of this kind is Galileo's return to the kinematics of the *Commentariolus* [of Coerpnicus] and his disregard for the machinery of epicycles as developed in the *De revolutionibus*" (*ibid.*, p. 114).

As we will detail later in Volume III, however, Galileo finally came to his senses after his chastisement from Pope Urban VIII. Without any hint that he is speaking under duress or to save himself from further condemnation, Galileo writes his letter to Francesco Rinuccini denouncing Copernicanism in the most explicit terms. Of course, the malice with which Galileo started his highfalutin theories continues today, since hardly anyone in the world has ever heard of the fact that Galileo renounced Copernicus in favor of geocentrism.

Isaac Newton
Climbing the Ladder of Success: One Body at a Time

Sir Isaac Newton

Although Isaac Newton is much deserving of scientific credit for at least providing mathematical formulas of motion that, within the margin of error, are quite accurate, his personal life was little to be admired. Kepler's jealousy of Brahe was only slightly worse than the avarice that drove Newton's to confiscate the work of his contemporaries and credit it to himself.

Case in point: astronomer John Flamsteed was the owner of voluminous notes charting lunar movements and the positions of the stars, notes that Newton desperately needed to fit the moon into his gravitational theory for the publishing of his famous *Philosophiae Naturalis Principia Mathematica*. A bitter feud resulted between the two men wherein Newton, using his influence with government officials, forced Flamsteed's hand. Not only did Newton surreptitiously wrest Flamsteed from his painstaking work, he did the same to Gottfried Leibniz, Stephen Gray and Robert Hooke. Regarding Leibniz, Westfall informs us:

> By 1713, moreover, Newton's perpetual neurosis had reached its passionate climax in the crusade to destroy the arch-villain Leibniz. Only a year earlier the Royal Society had published its Commercium epistolicum, a condemnation of Leibniz for plagiary and a vindication of Newton, which Newton himself

> composed privately and thrust upon the society's committee of avowed impartial judges.[606]

In 1666,[607] 1674[608] and again in 1679 in direct correspondence with Newton, Hooke published his theory of the 'inverse square law' regarding the force of gravity. Despite admitting in his letter to Hooke that Hooke deserved credit for the discovery, Newton tried to claim it as his own, feigning that he had thought about it many years earlier but didn't decide to publish it in his own book until thirteen years after the initial ideas came to him. As historian Ellen Tan Drake notes:

> Newton, however, claimed to have arrived at his universal law of gravitation at his country home in Woolsthorpe during the plague years 1665 or 1666 (it is not clear which), during his *annas mirabilis* (this "marvelous year" when the legendary apple fell). This date, of course, would clearly predate Hooke's expression of the law except that there is clear proof that as late as 1675, Newton still thought that the planets and Sun were kept apart by "some secret principle of unsociableness in the ethers of their vortices," and that gravity was due to a circulating ether that had to be replenished in the center of the Earth by a process like fermentation or coagulation.[609]

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[606] Richard S. Westfall, "Newton and the Fudge Factor," *Science*, 179, 751, 1973.

[607] Lecture given to the Royal Society titled *Planetary Movements as a Mechanical Problem*, on May 23, 1666, as reproduced in *Early Science in Oxford* by R. T. Gunther, 1930, ref. 1, Vol. vi, p. 256.

[608] Hooke's monograph: *An Attempt to Prove the Motion of the Earth by Observation*, London, 1674, as reproduced in *Early Science in Oxford* by R. T. Gunther, 1930, ref. 1, Vol. vii, pp. 1-28.

[609] *Restless Genius: Robert Hooke and his Earthly Thoughts*, Ellen Tan Drake, 1966, pp. 32-33. Drake's source is Newton's letter to Oldenberg, Dec. 7 1675, as cited in Turnbull, 1959, vol. 1: 368; Patterson, 1950. John Aubrey in *Aubrey's Brief Lives*, 1957, p. 166, confirms that Hooke's discovery of the Inverse Square Law predated Newton's *Principia*, as does I. Bernard Cohen: "In 1717 Newton wanted to ensure his own priority in discovering the inverse-square law of gravitation, and so he invented a scenario in which he made the famous moon test not while writing the *Principia* but two decades earlier in the 1660's.… Newton never published his invented scenario of the early moon test. He included it in the manuscript draft of a letter to the French writer Pierre Des Maizeaux but then crossed it out. Newton also circulated the familiar story that a falling apple set him on a chain of reflections that led to the discovery of universal gravitation. Presumably this invention was also part of his campaign to push back the discovery of gravity, or at least the roots of the discovery, to a time 20 years

Newton won the day against Hooke by using his influence at the Royal Society, just as he did in heading off the new discoveries of Robert Boyle, all in an effort to advance his own career.[610] On at least three separate occasions Newton introduced fallacious figures into the *Principia* in order to increase its apparent power of prediction.[611] As Westfall notes:

> And having proposed exact correlation as the criterion of truth, it took care to see that exact correlation was presented, whether or not it was properly achieved. Not the least part of the *Principia's* persuasiveness was its deliberate pretense to a degree of precision quite beyond its legitimate claim. If the *Principia* established the quantitative pattern of modern science, it equally suggested a less sublime truth that no one can manipulate the fudge factor quite so effectively as the master mathematician himself.[612]

Because of Newton's vast social influence, the book was considered an "epoch-making" work long before it was thoroughly reviewed, the highly popular John Locke having accepted it based merely on the word of Newton.[613]

In addition to the ill-treatment he gave to his scientific colleagues, Newton was rumored to have had a homosexual relationship with one John Wickins, a friend with whom he had lived for twenty years. He is also said to have had a liaison with Nicholas Fatio De Duillier, a man twenty years his junior and with whom he exchanged intimate letters, many of which were later censured by Newton or a confidant. Newton was also deep into alchemy (illegal at the time) and the Jewish Kabbalah, the occult musings of medieval Talmudic authors. Although he was reputed to have Christian

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before the *Principia*" ("Newton's Discovery of Gravity," *Scientific American*, 244 (3), 166, 1981).

[610] David Clark and Stephen P. H. Clark, *Newton's Tyranny: The Suppressed Scientific Discoveries of Stephen Gray and John Flamsteed*, 2001; Richard S. Westfall, *Never at Rest: A Biography of Isaac Newton*, 1981, 1983, pp. 471f, 601f; on Robert Boyle see *False Prophets*, Alexander Kohn, 1986, p. 39.

[611] Richard S. Westfall, "Newton and the Fudge Factor,", *Science*, 179, 751-758, 1973; *False Prophets*, Alexander Kohn, 1986, pp. 36-39.

[612] Richard S. Westfall, "Newton and the Fudge Factor," *Science*, 179, 751, 1973.

[613] Richard S. Westfall, *Never at Rest: A Biography of Isaac Newton*, 1981, 1983, pp. 469-470; Morris Kline, *Mathematics in Western Culture*, 1953, p. 230. See also Kline's *Mathematics: The Loss of Certainty*, 1982.

moorings, Newton embraced the heresy of Arianism (*i.e.*, the denial of both the divinity of Christ and the Trinity).[614]

Unknown to most, Newton spent most of his time interpreting biblical prophecy, writing over a million words on the subject. One of his more intriguing predictions is the date of 2060 A.D. as the end of the world, but that date surfaces only because Newton decided that the Roman Catholic Church was the Antichrist. Having arbitrarily put the Church's historical peak at 800 A.D., he interpreted the 1260 days of Apocalypse 11-13 as years, adding them to 800 A.D. to come up with 2060 A.D. as the date of the end of the world.[615] As Westfall says, Newton "hated and feared popery,"[616] and as Koestler concludes, Newton was "a crank theologian like Kepler…and held that the tenth horn of the fourth beast of the Apocalypse represented the Roman Catholic Church."[617]

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[614] Westfall writes: "In Newton's eyes, worshiping Christ as God was idolatry, to him the fundamental sin" (Richard S. Westfall, *Never at Rest: A Biography of Isaac Newton*, Cambridge University Press, 1981, 1983, p. 314). On Newton's intimacy with Wickens and Fatio, see *Isaac Newton: The Last Sorcerer*, Michael White, 1997, pp. 235-254. In addition, Voltaire had accused Newton of using his niece to entice politicians so that Newton could gain various positions of prestige. Voltaire writes: "I thought in my youth that Newton made his fortune by his merit. I supposed that the court and the city of London named him Master of the Mint by acclamation. No such thing. Isaac Newton had a very charming niece, Madame Conduitt, who made a conquest of the minister of Halifax. Fluxions and gravitation would have been of no use without a pretty niece" (*Dictionnaire Philosophique*, as cited in N. Martin Gywnne's *Sir Isaac Newton and Modern Astronomy*, Britons Catholic Library, n. d., p. 8). Westfall, although an admirer of Newton and predisposed to dismiss any hearsay, adds: "The wider ramifications with Halifax, and Newton's involvement in it, do not evaporate with equal ease," although "With Halifax the libertine, Victorian eulogizers could not bear to associate Newton. Nor could they bear the thought, the point of Voltaire's jibe, that Newton used the degradation of his niece to advance his own career." (*Never at Rest: A Biography of Isaac Newton*, 1981, 1983, pp. 596-597).

[615] Newton borrowed the '1260 days = 1260 year' scheme from the Puritan mystic Joseph Mede. Mede added the 1260 years to 400-455 AD and held that the end of the world would come around 1760-1815 AD. Others began at different dates (*e.g.*, Bengel at 576; Ellicott at 608; Melanchthon at 660, et al., most trying to bring the terminus to the Reformation). Newton believed that the Second Coming of Christ would follow plagues and war and would precede a 1,000-year reign of Christ and the saints on Earth, otherwise known today as "premillenniallism." He spent close to 50 years delving into biblical prophecy, writing over 4,500 pages in an effort to determine the end of the world. Many of these papers had lain undisturbed in the house of the Earl of Portsmouth for 250 years, which were eventually sold by Sothebys in the late 1930s. This collection of papers was purchased by Abraham Yahuda, and was stored in the Hebrew National Library. It was among these documents that the date 2060 was found. (See also Michael White's *The Last Sorcerer*, pp. 156-157).

Albert Einstein
Everything's Relative: Including Morality

Albert Einstein's biography is one of the more lurid in the annals of science, but most of it has been hidden from the public for many years. Although *Time* magazine named him "Person of the Century,"[618] as a matter of fact, few in modern history have been so thoroughly shrouded in impenetrable media insulation as Einstein. The decease of the executors of his estate, Helen Dukas (d. 1982) and Otto Nathan (d. 1987) precipitated the release of many of Einstein's previously censured personal papers.[619]

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[616] Richard S. Westfall, *Never at Rest: A Biography of Isaac Newton*, 1981, 1983, p. 483.

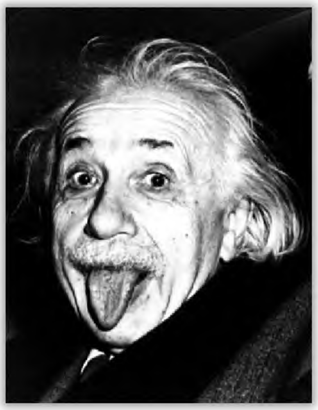
[617] Arthur Koestler, *The Sleepwalkers*, p. 536.

[618] Stephen Hawking, "Person of the Century," *Time Magazine*, December 31, 1999. *Time* lavished praise on Einstein with such phrases as: "first among the century's giants," "its greatest scientific genius," "the person who, for better or worse, personified our times and will be recorded in history as having the most lasting significance," "the world's first scientific celebrity," "the century's greatest thinker," and "the patron saint of distracted schoolkids." Such unqualified admiration for Einstein is quite sacrosanct in the scientific field. In the book *Einstein's Unfinished Symphony* by Marcia Bartusiak (New York, Berkley Books, 2000, p. 4), MIT scientist Rainer Weiss, working on the federally funded LIGO system to test for gravity waves to confirm General Relativity, is quoted as saying: "The worship of Einstein, it's the only reason we're here, if you want to know the truth." Incidentally, Bartusiak's book is titled "Unfinished Symphony" because, of all the LIGO systems built across the world, no one has ever detected General Relativity's "gravitational wave" (*ibid.*, p. 10).

[619] Helen Dukas had motivation to do so, since she met Einstein in 1928 when Einstein's second marriage [to his cousin Elsa Löwenthal] was rapidly deteriorating, of which Elsa "sought as far as possible to block the subject of infidelity from her mind" (*The Private Lives of Albert Einstein*, p. 210). Zackheim adds: "Hans Albert suspected they were lovers. His allegation was fortified by the proximity of her room in Princeton – just off Albert's study and down the hall from Elsa's. In addition, Einstein left Dukas more money in his will than any other member of his blood family, as well the net income from his royalties and copyright fees and all his books and personal effects" (*Einstein's Daughter: The Search for Lieserl*, p. 253). Highfield and Carter add: "Dukas became fiercely loyal to her employer: she was liable to attack as 'dung' any biography that dared

In them we find that, close behind the wire-haired, absent-minded and winsome Dr. Jekyll, there lurked a veritable Mr. Hyde.

Einstein's misdeeds began early in his career. He fathered a daughter out of wedlock with Mileva Marić, although the couple eventually married. They named the child Lieserl, but that is all the attention she would ever receive from Einstein. He persuaded Mileva to give the child to an orphanage so that he could avoid the social repercussions of having an illegitimate daughter. He handled it as a mere business transaction, for he never saw Lieserl face-to-face. As biographer Michele Zackheim explains it:



> Einstein scholars have concluded from his September 19 [1903] letter that the couple had decided to put Lieserl up for adoption, based on Albert's concern that the child's registration (or lack thereof) not be a source of trouble for her – or her parents – in the years to come….Apparently, in the end, Albert and Mileva agreed it would be best to pretend that Lieserl had never existed. And so, with a deliberate hand, the short life of Lieserl Einstein-Marić was erased.[620]

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shed light on Einstein's personal life, and she saw newsmen as her 'natural enemies'" (*The Private Lives of Albert Einstein*, p. 211).

[620] *Einstein's Daughter: The Search for Lieserl*, pp. 52-53. Zackheim also concludes from her massive evidence that Lieserl had a severe mental handicap, which helped seal the Einsteins' decision, and that she died at twenty-one months old, on September 21, 1903. Mileva's father was given the task of making sure that no official records concerning her short life remained in any governmental or church repositories (*ibid.*, pp. 276-277). Highfield and Carter describe the situation: "There is no evidence that Einstein and his daughter ever set eyes on one another. For all his apparent enthusiasm after the birth, it seems that his main concern was to free himself of this burden at the earliest opportunity. Lieserl's existence was kept hidden even from his closest friends, and within months she had disappeared from his life without trace. Einstein was never to talk of her publicly, and Lieserl might have been erased from history had it not been for the discovery of his letters to Mileva by the Einstein papers project….The dangers that seemed to preoccupy him were unconnected to the child's illness: his question about registration strongly suggests that she was being surrendered for adoption, and that Einstein was eager to cover his tracks. The lack of any official record of the birth would appear to be a tribute to the thoroughness of the precautions that he referred to. Lieserl's birth posed a threat to Einstein's new start as a patent

Albert and Mileva Einstein, circa early 1900s

That such callousness wasn't merely an incidental quirk is demonstrated when Einstein later forsook his son Eduard and consigned him to a sanatorium so that he could be relieved of the financial responsibility of Eduard's care and take full advantage of the public funding available. Eduard eventually died in the sanatorium.[621]

Einstein's indifference to his children, however, was overshadowed by the animosity he showed to his wife. According to the divorce papers, Mileva was the victim of physical violence in the marriage, and Einstein's adultery was the final straw that led to the legal separation in 1914 and final divorce in 1919.[622] As the marriage to Mileva began to deteriorate,

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examiner in Berne. He had gained Swiss citizenship only a year earlier, and the stigma of an illegitimate child would have harmed his prospects…The couple's meager income may have provided another motive for giving the child away…" (*The Private Lives of Albert Einstein*, pp. 88-90).

[621] Mileva wrote to Albert: "'You have here a dear, seriously ill child. Often he asks if his father will come, and with each postponement, he becomes even more morose. He is terribly wounded.' Albert refused to come back to Zurich to see Eduard. And he refused to acknowledge the financial and psychological battles that Mileva had to wage over his care" (*Einstein's Daughter*, p. 190).

[622] Zackheim writes: "He tended to have a few romances going at once, but after Mileva, he was known to prefer simpler women" (*Einstein's Daughter*, p. 227). Highfield and Carter write: "Einstein was obliged to admit in his legal submissions that he had committed adultery. There were also references to fierce fights between him and his wife, which had made their continued marriage intolerable" (*The Private Lives of Albert Einstein*, p. 188). Zackheim gives the wording of the deposition from Einstein's own hand: "…It is true that I have committed adultery. I have been living for approximately four and one-half years with my cousin, the widow Elsa Löwenthal, and since then I have had intimate

"Einstein established himself in a bachelor apartment around the corner from Elsa," his cousin and next love interest, whom he eventually married in 1919, only four months after his divorce.[623] In one of his more audacious moves, Einstein had actually pleaded with Mileva to allow him to marry Elsa, using as his excuse that Elsa's daughter "…had to suffer from rumors that have been circulating regarding my relationship with her mother. That weighs upon me and needs to be remedied through a formal marriage."[624] If this had been the real motive for Einstein's pleading, we might be tempted to conclude that he was merely a deranged individual who had lost touch with reality. The real truth is even more sinister and shocking. The thirty-nine-year-old Einstein was actually in a debate with himself whether he should marry Elsa or her twenty-year-old daughter, Ilse, while all along he had been shacking up with Elsa (for the four years prior), and while still married to Mileva. As Zackheim explains:

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relations with her. My wife, the plaintiff, has been informed that I have had intimate relations with my cousin since the summer of 1914" (*Einstein's Daughter*, p. 87). In a related incident, the biographers add: "The following day Lisbeth and her mother visited Mileva and found her face badly swollen. It seems that Lisbeth may have been suggesting that Mileva had been beaten. Einstein was a powerful man and, for what it is worth, Hans Albert recalled that when he misbehaved his father 'beat me up'. …. It is known that Einstein's divorce papers – which remain under seal in Jerusalem – refer to violence within the marriage" (*The Private Lives of Albert Einstein*, pp. 153-154; See also *Einstein's Daughter*, p. 73). After Mileva suspected an affair between Albert and Anna Meyer-Schmid, Albert complained that this "was typical in a woman of such 'uncommon ugliness,'" adding, "Professor John Stachel says this remark was the first to shock him as he worked through Einstein's papers after his appointment as their editor" (*Private Lives*, pp. 125-126). Mileva describes herself as "starved for love" as early as 1900 (*ibid*., p. 128). See also *In Albert's Shadow: The Life and Letters of Mileva Marić*, pp. 16-17.

[623] *The Private Lives of Albert Einstein*, p. 172. Yet, Highfield and Carter add: "But there is no evidence that Mileva believed her husband was about to be stolen from her, battered though their marriage was. Einstein…had no plans to leave her. Instead he intended to pursue his affair while remaining her husband. … He remarked to Elsa 'But the order is always to pretend. Only when we are born and when we die are we permitted to act in an honest way'" (*The Private Lives of Albert Einstein*, pp. 163-164); "Mileva would remain a virtual invalid for three years after Albert's decision to end the marriage…" (*In Albert's Shadow*, p. 19). Prior to his involvement with Elsa, Einstein had a short fling with Paula Einstein, Elsa's sister, but soon ended the relationship. He then wondered why he had become involved with her, settling for the rationale that "she was young, a girl, and complaisant. That was enough" (*Einstein's Daughter*, p. 72).

[624] *Einstein's Daughter*, p. 85.

Hans Albert and his father

> Albert was not being honest [with Milvea]. By May [1918], he had made it clear that he wanted to marry Elsa's daughter Ilse. Ilse reported to a friend, Georg Nicolai: "Yesterday, suddenly the question was raised about whether A[lbert] wished to marry Mama or me…A[lbert] himself is refusing to take any decision, he is prepared to marry either Mama or me. I know that A[lbert] loves me very much, perhaps more than any other man ever will, he also told me so himself yesterday…"[625]

In the waning months of his time with Mileva, records made public in 1996 show that Einstein gave her a list of conditions in order for her to remain under his financial care:

- You will see to it: (1) that my clothes and linen are kept in order; (2) that I am served three regular meals a day in my room; (3) that my bedroom and study are always kept in good

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[625] *Einstein's Daughter*, pp. 85-86. Zackheim adds: "At the top of the letter, Ilse had written, 'Please destroy this letter immediately after reading it!'" Shortly after Ilse wrote this letter, Albert wrote to Mileva and told her that he had changed his mind about coming to see the boys in the summer. Instead, he had decided to go to Ahrenshoop, a remote village on the Baltic Sea, with Elsa, Ilse, and Ilse's younger sister, Margot" (*ibid.*, p. 86). Sixteen years later when Ilse lay dying of cancer in Paris at age 34, Elsa asked Albert to go to her bedside but he refused (*A World Without Time: The Forgotten Legacy of Gödel and Einstein*, p. 148).

> order and that my desk is not touched by anyone other than me.
>
> - You will renounce all personal relationships with me, except when these are required to keep up social appearances. In particular, you will not request: (1) that I sit with you at home; (2) that I go out with you or travel with you.
>
> - You will promise explicitly to observe the following point in any contact with me: (1) You will expect no affection from me and you will not reproach me for this; (2) You must answer me at once when I speak to you; (3) You must leave my bedroom or study at once without protesting when I ask you to go; (4) You will promise not to denigrate me in the eyes of the children, either by word or deed.[626]

Mileva was apparently no fool. A few months after receiving the above letter she moved to Zurich with her children and never returned to Einstein.

Things fared no better for Elsa, the eventual winner of the ‘Elsa versus Ilse’ contest. Einstein persuaded Elsa to divorce her husband, Max Löwenthal, so that the two lovers could marry. But this marriage shortly began to deteriorate due to Einstein’s sexual affairs. According to one biographer, “she told him he could have a woman on the side, but only one at a time,”[627] and to her dismay, Einstein’s adultery was, indeed, serial.[628] As he had with Mileva, Einstein recast their relationship as one of mere convenience. She died in 1936, nineteen years before Einstein.

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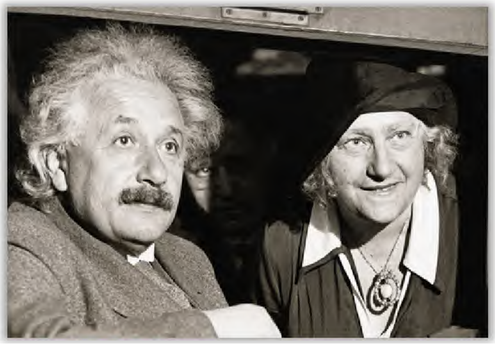
[626] *London Daily Telegraph*, October 30, 1996; *Einstein’s Daughter*, p. 77. In one of his love letters to Elsa, Einstein wrote: “I treat my wife as an employee whom I cannot fire. I have my own bedroom and avoid being alone with her” (*Einstein’s Daughter*, p. 73).

[627] From biographer Michael Shara, *Discover*, Sept. 2004, pp. 29-30. Highfield and Carter write: “It has to be said that Elsa was not the only one of Einstein’s female relatives to catch his eye. It appears that, either during this trip or some time earlier, he had also flirted with her younger sister, Paula” (*The Private Lives of Albert Einstein*, p. 148).

[628] Highfield and Carter note: “Einstein joked that he preferred ‘silent vice to ostentatious virtue,’ but there was little that was furtive about his affairs. Either they were conducted in open view, or easy clues were left for Elsa to discover. Another incident…gives the impression that Einstein was eager for his wife to know what he was up to…” (*The Private Lives of Albert Einstein*, p. 209).

It is amazing to read what other scientists say about this part of Einstein's life. We encounter nothing short of a willful moral blindness to his immoral exploits. For example, Ludwik Kostro, concealing any unethical behavior on the part of Einstein, writes:

> His wife and two sons left him soon after that, moving back to Zürich, and it was a shock to him. After she left him, he rented a bachelor flat at 13 Wittelsbach-erstrasse.[629]



Einstein with his new wife, Else Lowenthal

Yet perhaps the reason Kostro writes such a biased description is that he is merely citing one of the chief biographies of Einstein, which is itself a systematic and deliberate attempt to conceal Einstein's improprieties. The book is *Subtle is the Lord* written by Abraham Pais.[630] The mere title implies that Pais set out to idolize Einstein and make it appear as if his theories were divinely endorsed, if not inspired. Although Roger Penrose is honest enough in the Foreword to admit that: "Einstein was certainly no saint,"[631] his penetration stops there, and following him, Pais fails to mention even one incident of Einstein's unethical or immoral behavior in his entire 552 page treatise. Whenever accusations of plagiarism surface against Einstein, Pais invariably makes it appear as if Einstein miraculously and coincidentally came to the same discovery by his own independent study. Whenever Einstein is guilty of abandoning his family, Pais invariably makes it appear as if Einstein is a dedicated father who is misunderstood. Whenever Einstein is guilty of adultery, Pais glosses over it and divulges no such improprieties. Instead he makes Einstein's wives appear as if they are neurotic, referring to Mileva as a “difficult woman, distrustful of other people and given to spells of melancholy,”[632] but never making so much as a suggestion that she might have fallen into such mistrust and depression because her husband was committing heinous sins against her and the family.

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[629] *Einstein and the Ether*, Aperion, 2000, p. 57.

[630] Abraham Pais, *Subtle is the Lord: The Science and Life of Albert Einstein*, 1982, 2005. Kostro cites pp. 224, 240.

[631] *Ibid*., p. ix.

Pais is not alone in his exoneration of Einstein. Gerald Holton, the Harvard physicist and scientific historian excuses Einstein’s behavior as a mere product of his times. He writes:

> You have to keep in mind that in Europe at the time, for a pursued charismatic man, his behavior wasn’t so unusual. Moreover, the letters show that it was generally he who asked to end such [adulterous] relationships.[633]

In addition to his sexual escapades, Einstein was suspected of plagiarism, as well as failing to give scientific credit to Mileva who helped him develop his Relativity theories.[634] As we noted in Vol. 1, Appendix 2, one of the biggest myths surrounding the aura of Einstein is that he was the inventor of the famous $E=mc^2$ formula. In actuality, there were at least a dozen scientists who had either developed or employed the formula prior to Einstein.

Other instances of Einstein’s outright plagiarism abound. Although Abraham Pais does his best either to minimize or to make these incidents coincidental, the facts speak for themselves.[635] One of the more notable instances occurs in September 1924. At a meeting of famous physicists Einstein proposed that the community investigate interference and diffraction phenomena with molecular beams. Louis de Broglie, however, had already been working on the idea for quite a while and eventually published a paper on it in November 1924. As it turns out, de Broglie had sent a copy of the unpublished manuscript to Paul Langevin some months earlier, and Langevin had passed it to Einstein, whereupon Pais records Einstein's reaction that de Broglie's ideas "seemed quite interesting to him."[636] Obviously, Einstein obtained the notion of searching for "interference and diffraction phenomena with molecular beams" from de Broglie's unpublished paper, but he failed to mention de Broglie's work to the September 1924 audience of physicists, thus leaving the impression that this was all his idea. De Broglie himself says: "I am certain that Einstein knew of my Thèse since the spring of 1924."[637] In the face of all this weighty circumstantial evidence, Pais, as he is prone to do in his biography, glosses over them and concludes: "Thus, Einstein was not only one of the three fathers of the quantum theory, but also the sole godfather of wave mechanics."[638]

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[632] *Ibid*., p. 301. Pais complete description of these events is limited to pages 300-301. The reader would simply have no inkling to Einstein’s malice upon reading Pais’ biography.

[633] “Einstein’s Theory of Fidelity,” *Discover*, October 2006, p. 48. The last of Einstein’s love letters were released in the summer of 2006 which, at the request of his stepdaughter, Margot, was to be initiated twenty years after her death.

[634] Highfield and Carter note: “As he grew older, Einstein had begun to express some very bitter feelings towards the opposite sex” (*The Private Lives of Albert Einstein*, p. 209). On the accusations of plagiarism, see C. J. Bjerknes, *Albert Einstein: The Incorrigible Plagiarist*, 2002; R. Carroll, “Einstein’s $E = mc^2$ ‘was Italian’s idea,’” *The Guardian*, Nov. 11, 1999; G. H. Keswani, “Origin and Concept of Relativity,” *British Journal of the Philosophical Society*, 15:286-306, 1965; Richard Moody, Jr., “Plagiarism Personified,” *Mensa Bulletin*, 442, Feb.: 5, 2001; *The Private Lives of Albert Einstein*, pp. 108-109.

[635] Abraham Pais, *Subtle is the Lord: The Science and the Life of Albert Einstein,* 1982, 2005. Pais claims Einstein’s ignorance in many instances: “In 1905, at that time [he was] aware only of Lorentz’s writing up to 1895” (*ibid*., p. 21); “…in the period of 1902-04…his knowledge of the writings of Ludwig Boltzmann was fragmentary and he was not at all aware of the treatise by Josiah Willard Gibbs”

Physically speaking, the youthful Einstein was the epitome of strength, vigor, and good looks. But as the years wore on, Einstein became grossly unhygienic, refusing to brush his teeth or even change his clothes. The image of the unkempt, wire-haired professor is not the prop of a Hollywood producer but the symptoms of a man who was losing his grip on life.[639]

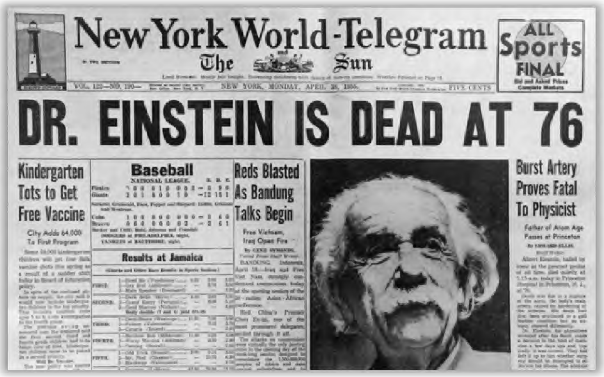
(*ibid.*, p. 55); "In 1905, Einstein was blissfully unaware of the detailed history of Brownian motion. At that time, he knew neither Poincaré's work on relativity…" (*ibid.*, p. 94); "By a quite remarkable coincidence, Eq. 5.12 was discovered in Australia at practically the same time Einstein did his thesis work. In March 1905 William Sutherland submitted a paper that contained the identical result…" (*ibid.*, p. 92); and claims that Einstein knew nothing of the work of David Hilbert: "Five days earlier, David Hilbert had submitted a paper…which contained the identical equation but with one qualification. Einstein, having learned the hard way from his mistakes a few weeks earlier…" (*ibid.*, p. 257), yet in all these cases Einstein's work contains other men's ideas and equations.

[636] *Subtle is the Lord*, p. 438.

[637] Letter to Abraham Pais from Louis de Broglie, September 26, 1978, cited in *Subtle is the Lord*, p.438.

[638] *Subtle is the Lord*, p. 438.

[639] *The Private Lives of Albert Einstein*, Robert Highfield and Paul Carter, 1993, pp. 59-217; *In Albert's Shadow: The Life and Letters of Mileva Marić*, ed. Milan Popocić, 2003, pp. 16-27; "Whose Relativity Was It, Anyway?" Patricia Nemo, *College of St. Thomas Magazine*, Spring 1990, pp. 22-25; "Sex-mad Father of Relativity left family out of equation," *London Daily Telegraph*, Anthea Hall, July



New York World-Telegram

The Sun

ALL Sports FINAL

NEW YORK, MONDAY, APRIL 18, 1955

FIVE CENTS

DR. EINSTEIN IS DEAD AT 76

Kindergarten Tots to Get Free Vaccine

City Adds 64,000 To First Program

Baseball

Results at Jamaica

Reds Blasted As Bandung Talks Begin

Free Vietnam, Iraq Open Fire

Burst Artery Proves Fatal To Physicist

Father of Atom Age Passes at Princeton

Eventually, the promiscuous lifestyle of his earlier years may have finally caught up with him. Einstein's personal doctor, János Plesch, who knew him quite well, concluded that he died of syphilis, demonstrating from the results of the autopsy that the abdominal aneurysm that took his life is always associated with the tertiary stage of syphilis, which can be 25 years or longer from time of onset. Historians Highfield and Carter write that, in an April 18, 1955 letter to his son Peter, Plesch, remarking on Einstein's sexual escapades, stated:

> \“Why shouldn't a healthy and beautiful man have had bad luck in his youthful daredevil days and contracted a lues [syphilis]?” Plesch insisted that Einstein's symptoms were entirely consistent with the disease, and boasted that in all his years of medical practice he had never once been wrong in tracing an abdominal aneurysm to this cause.[640]

25, 1993; “Relatively imperfect genius,” *Jewish Chronicle*, Monica Porter, August 8, 1993.

[640] *The Private Lives of Albert Einstein*, pp. 265-266. The biographers add: “It appears that the same thoughts may have been occupying Seelig, for the cause of the aneurysm was a point on which he had been pressing Nathan….One is tempted to wonder whether the possibility of syphilis had occurred to Nathan too. Dr. Harvey has stated that, medically speaking, Plesch ‘had justification for thinking along those lines,’ but added, ‘It is known that tertiary syphilis does cause aneurysms, but not in this location very often’” (*ibid*., p. 266). Mileva's letters reveal that in Albert's reading of the book *Die Sexuelle Frage*, he had underlined the parts dealing with venereal disease. Zackheim notes: “this highlighted passage about venereal disease suggests that Mileva apparently worried about Albert's sexual life outside their bedroom. Furthermore, Einstein historians believe that Albert frequented prostitutes before he married, and that

Michele Zackheim's research reveals the following:

> He [Plesch] also insisted that Albert had syphilis, the 'gentlemen's disease.' "In my long medical practice I have found, almost without exception, that abdominal aneurysms which Einstein suffered from are syphilitic in origin. It might, of course, be that Einstein was exceptional in that respect too and that his aneurysm was nonspecific. However, an earlier syphilitic infection is also indicated by the fact that he suffered from extensive secondary anemia attacks…I think the infection was acquired during the interval [between his marriages]…. Even though many may shake their heads about this, I am adhering to my thesis.[641]

Mileva may have been aware of it" (*Einstein's Daughter*, p. 268). "…Janos Plesch, who described his friend [Einstein] as a man with a strong sex drive… 'in the choice of sex partners he was not too discriminating,' wrote Plesch… 'Einstein loved women, and the commoner and sweatier and smellier they were, the better he liked them'" (*The Private Lives of Albert Einstein*, p. 206); "Einstein was also voicing deep misgivings about the institution of holy matrimony. He told Plesch that it must have been invented 'by an unimaginative pig,' and…it was 'slavery in a cultural garment'" (*ibid*., p. 210). Deborah Hayden's article, titled "Syphilis in the Einstein Factory," says that the interest level from other biographers regarding the possibility that Einstein contracted syphilis is practically nil. In order to protect Einstein, most have ignored or ridiculed the suggestion, yet Einstein's numerous sexual affairs remain an open book. Some doctors claim that abdominal aneurysms are not all caused by syphilis although they admit that many cases are (from a 6-17-05 letter to me from Deborah Hayden on file, used with permission).

[641] *Einstein's Daughter: The Search for Lieserl*, p. 255. Zackheim adds: "Dr. János Plesch had maintained that Albert contracted syphilis sometime between leaving Mileva and marrying Elsa. But Albert could have contracted the disease prior to 1910, when he began to exhibit active interest in other women. If Albert had contracted syphilis before Mileva became pregnant with Eduard, in November 1909, or even before Lieserl was born, in 1902, he might have passed the syphilis to Mileva, who could have been a latent carrier. She, in turn, could have passed it to a baby *in utero*. The closer to conception that the mother is infected, the greater the risk of congenital syphilis in the fetus, which can result in a variety of birth defects from skin lesions to a failure to thrive to an enlarged liver and spleen to mental retardation. But with a mother who is a latent carrier, a healthy child can be born between two syphilitic children. Hans Albert, Mileva and Albert's only healthy offspring, was a middle child" (*ibid*., p. 268). Despite his candidness about Einstein's syphilis, Plesch had written a much softer biography of Einstein, after having discussed its contents with Einstein. In remarking on the book, Plesch tells Einstein: "You can believe me that while I was writing these seven

For the record, syphilis is purported to be the impetus for the genius, and often the eventual madness, of many notables in history (*e.g.*, Beethoven, Capone, Dostoyevsky, Goya, H. Hughes, Hitler, Joyce, Lenin, Lincoln, Mozart, Napoleon, Nietzsche, Poe, Roosevelt, Toulouse-Lautrec, van Gogh, Wilde, *et al.*).[642] Whether or not this phenomenon had anything to do with Einstein's fantastic Relativity theories, we do not have enough evidence to make a firm conclusion, but the possibility certainly exists.

On the religious side of things, Mileva and her children converted to Catholicism in 1905, a fact little advertised by the secular press, then or now.[643] The year 1905, of course, was when his Relativity theory was introduced to the scientific community. Unmoved by his wife's religious life, Einstein wrote to his confidante Professor Hurwitz: "They've turned Catholic. Well, it's all the same to me."[644]

Einstein was, for all intents and purposes, an atheist.[645] Any notions he had of God were of an entity completely impersonal and uninvolved

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hundred pages, I was laughing a lot about how marvelously we are all trained to lie and how little human beings are allowed to state the truth. Our good Ibsen hit the nail on the head when he said, 'Take somebody's life lie away and you will take away his whole life.' The book is written with this compromise" (*ibid*., p. 249). Unfortunately, the publisher destroyed the book.

[642] *Pox: Genius, Madness and the Mysteries of Syphilis*, Deborah Hayden, 2003, p. 306f.

[643] *Einstein: The Life and Times*, Ronald W. Clark, p. 139.

[644] *Einstein: Life and Times*, p. 139. When Einstein reached his heyday in the world, Cardinal O'Connell of Boston concluded that Relativity theory "cloaked the ghastly apparition of atheism" and "befogged speculation, producing universal doubt about God and His Creation" (*ibid*. p. 502).

[645] *The Private Lives of Albert Einstein*, p. 18. The authors write: "Einstein's views were atheistic in almost every important respect. He found it impossible to conceive of a personal deity, had no belief in an afterlife and considered morality an entirely man-made affair. His worship of cosmic harmony was genuine; his claims that this was the face of God were at best benign affectation." Highfield and Carter add that Einstein's pupil in Zurich, David Reichinstein, writes of a "Messiah-feeling" unfolding in Einstein's psyche, so much so that "his account contains dark hints that Einstein's arrogance bordered on hubris" (*ibid*., p. 127). "Einstein was well aware that his harsh attitude disturbed people" (*ibid*., p. 180). After quoting Einstein's statements: "I'm not an atheist, and I don't think I can call myself a pantheist….I am fascinated by Spinoza's pantheism….I believe in Spinoza's God who reveals himself in the orderly harmony of what exists, not in a God who concerns himself with fates and actions of human being," Max Jammer concludes that Einstein was a "practical atheist" because "there is no difference between there being no God to bother about man, and there being a God who does not concern himself with the fates and actions of human beings" (*Einstein and Religion*, pp. 48-50).

with human affairs. In one letter he wrote: “The word God is for me nothing more than the expression and product of human weaknesses, the Bible a collection of honorable but still primitive legends which are nevertheless pretty childish.”[646] His closest friends and colleagues, such as “the Austrian socialist Friedrich Adler or the members of the ‘Olympia Academy’ in Berne, Maurice Solovine, Conrad Habicht, and Michel Angelo Besso…For all of them, the ideologies of Marx and Mach replaced the religion of the Bible.”[647] His path toward allowing science to unseat Scripture and the Church as the ultimate authority for any intellectual endeavor that crossed its domain had begun very early in his life. After receiving instruction at Bavarian schools, which included teaching on the Catholic faith (and in particular the traditional six-day creation), “at the age of twelve…he suddenly became completely irreligious.”[648] Einstein later reflected:

> Through the reading of popular scientific books I soon reached the conviction that much in the stories of the Bible could not be true. The consequence was a positively fanatic [orgy of] free thinking coupled with the impression that youth is intentionally being deceived by the state through lies; it was a crushing impression. Suspicion against every kind of authority grew out of this experience, a skeptical attitude towards the convictions which were alive in any specific social environment – an attitude which has never again left me…[649]

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[646] Letter wrote in 1954 to the philosopher Eric Gutkind, which recently sold for $404,000 at an auction in London (*New York Times*, May 17, 2008, Dennis Overbye). As for his own race, the Jews, Einstein wrote in the same letter: “As far as my experience goes they are also no better than other human groups, although they are protected from the worst cancers by a lack of power. Otherwise I cannot see anything ‘chosen’ about them.”

[647] Max Jammer, *Einstein and Religion*, p. 29. Jammer adds: “Some authors assign these ideological influences a crucial role in Einstein’s intellectual development and regard them, in particular, as the driving force for his creation of the theory of relativity” (*ibid*).

[648] Max Jammer, *Einstein and Religion*, p. 24.

[649] Max Jammer, *Einstein and Religion*, p. 25. Jammer adds: “An immediate consequence of this change of mind was the fact that Einstein refused to become bar mitzvahed…[which] even liberal Jews regard it as a precept that must be obeyed….As far as we know, Einstein never attended religious service and never prayed in a synagogue or at any other place of worship….Einstein’s last wish was not to be buried in the Jewish tradition, but to be cremated and his ashes scattered, indicating that he disregarded religious rituals until his death on 18 April 1955” (*ibid.*, pp. 25, 27).

At another time he said: “It is quite possible that we can do greater things than Jesus, for what is written in the Bible about him is poetically embellished.”[650] Obviously, Scripture’s insistence on an Earth-centered cosmos is one idea Einstein had long ago dismissed as a childish fantasy. This presupposition is noted in an address to Princeton Theological Seminary (a seminary which by this time had become very liberal in its theology, denying the inerrancy of Scripture and the literal interpretation of Genesis to make room for the theory of evolution) to which Einstein stated:

> For example, a conflict arises when a religious community insists on the absolute truthfulness of all statements recorded in the Bible. This means an intervention on the part of religion into the sphere of science; this is where the struggle of the Church against the doctrines of Galileo and Darwin belongs.[651]

Einstein excused his immoral life as mere “stupidities” and blamed God for creating him:

> I see only with deep regret that God punishes so many of his children for their numerous stupidities, for which he himself can be held responsible; in my opinion, only his nonexistence could excuse him.[652]

Yet Einstein would later modify his position:

> In view of such harmony in the cosmos which I, with my limited human mind, am able to recognize, there are yet people who say there is no God. But what makes me really angry is that they quote me for support of such views.[653]

At times Einstein wrestled with the concept of God. In one of his later works he writes:

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[650] Quoted in W. Hermanns, “A Talk with Einstein,” October 1943. Einstein archive 55-285. Cited in *The Expanded Quotable Einstein*, p. 215.

[651] Albert Einstein, *Ideas and Opinions*, 1984, p. 45.

[652] To Edgar Meyer, a Swiss colleague, January 2, 1915. CPAE, Vol. 8, Doc. 44, *The Expanded Quotable Einstein*, 2000, p. 201.

[653] To a German anti-Nazi diplomat and author, Hubertus zu Löwenstein around 1941. Quoted in Löwenstein’s book *Towards the Further Shore*, London, 1968, p. 156. Cited in the *Expanded Quotable Einstein*, p. 214.

> The idea of God in the religions taught at present is a sublimation of that old concept of the gods. Its anthropomorphic character is shown, for instance, by the fact that men appeal to the Divine Being in prayers and plead for the fulfillment of their wishes. Nobody, certainly, will deny that the idea of the experience of an omnipotent, just, and omnibeneficent personal God is able to accord man solace, help, and guidance; also, by virtue of its simplicity it is accessible to the most undeveloped mind. But, on the other hand, there are decisive weaknesses attached to this idea in itself, which have been painfully felt since the beginning of history. That is, if this being is omnipotent, then every occurrence, including every human action, every thought, and every human feeling and aspiration is also His work; how is it possible to think of holding men responsible for their deeds and thoughts before such an almighty Being? In giving out punishment and rewards He would to a certain extent be passing judgment on Himself. How can this be combined with the goodness and righteousness ascribed to Him. The main source of the present-day conflicts between the spheres of religion and of science lies in this concept of a personal God.[654]

This rationale for being an agnostic is ironic, in a way, since the complaint of not being able to combine God's omnipotence with man's free will comes from a man who had little problem combining the hitherto incompatible entities of space and time, energy and mass, inertia and gravity, and matter and antimatter. In fact, Einstein was known for trying to simplify things by combining them, as he sought, although in vain, for his Unified Field Theory. As Einstein himself admits about the methodology:

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[654] Albert Einstein, *Out of My Later Years*, 1950, p. 27; and Albert Einstein, *Ideas and Opinions*, 1984, pp. 46-47. In his book *The World as I See It*, Einstein writes: "I cannot conceive of a God who rewards and punishes his creatures, or has a will of the kind that we experience in ourselves. Neither can I nor would I want to conceive of an individual that survives his physical death; let feeble souls, from fear or absurd egoism, cherish such thoughts. I am satisfied with the mystery of the eternity of life and with the awareness and a glimpse of the marvelous structure of the existing world, together with the devoted striving to comprehend a portion, be it ever so tiny, of the Reason that manifests itself in nature" (Citadel Press, translated by Alan Harris, 1956, 1984, originally published in 1934).

> [Science] seeks to reduce the connections discovered to the smallest possible number of mutually independent conceptual elements. It is in this striving after the rational unification of the manifold that it encounters its greatest successes…[655]

So why someone who spent his whole life combining incompatible things would suddenly falter when it involved a unification between God's will and man's will, is surprising. Perhaps, with Einstein's apparent fear of being held responsible for his "deeds and thoughts" and having to face the Almighty's "reward and punishment," he is echoing the deepest motives of all men who suppress the evidence of His existence in order to make themselves appear autonomous.

Einstein assured his followers that he, indeed, did not believe in a personal God, and, in fact, had no religious leanings other than, perhaps, the "structure of the world."

> It was, of course, a lie what you read about my religious convictions, a lie which is being systematically repeated. I do not believe in a personal God and I have never denied this but have expressed it clearly. If something is in me which can be called religious then it is the unbounded admiration for the structure of the world so far as our science can reveal it.[656]

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[655] Albert Einstein*, Ideas and Opinions*, 1984, p. 49.

[656] *Albert Einstein: The Human Side*, editors: Banesh Hoffman and Helen Dukas, 1981. In the same source, Einstein is quoted as saying: "I do not believe in immortality of the individual, and I consider ethics to be an exclusively human concern with no superhuman authority behind it." To a child who asked if scientists prayed, Einstein responded: "Scientific research is based on the idea that everything that takes place is determined by laws of nature, and therefore this holds for the action of people. For this reason, a research scientist will hardly be inclined to believe that events could be influenced by a prayer, *i.e.* by a wish addressed to a Supernatural Being." Einstein had a particular animosity for the Catholic Church. Another book by the same editors, *Albert Einstein: Creator and Rebel*, contains anecdotes that appear to be for the purpose of creating a cult following for Einstein. Other remarks from Einstein about God include: "Everything is determined, the beginning as well as the end, by forces over which we have no control. It is determined for the insect as well as for the star. Human beings, vegetables, or cosmic dust, we all dance to a mysterious tune, intoned in the distance by an invisible piper" (*Einstein: The Life and Times*, p. 422). In 1921 he replied to a Jewish rabbi: "I believe in Spinoza's God who reveals himself in the orderly harmony of what exists, not in a God who concerns himself with fates and actions of human beings" (*Einstein: The Life and Times*, p. 502). More to the point, Einstein writes: "I cannot conceive of a God who rewards and punishes his

His own reasons for rejecting a personal God are stated quite clearly. Albert Einstein was a humanist who gave no credence to the divine. This is summed up in one short sentence of his: "There is nothing divine about morality, it is a purely human affair."[657] He elaborates on this conviction in the following paragraph:

> To be sure, the doctrine of a personal God interfering with natural events could never be refuted, in the real sense, by science, for this doctrine can always take refuge in those domains in which scientific knowledge has not yet been able to set foot. But I am persuaded that such behavior on the part of the representatives of religion would not only be unworthy but also fatal. For a doctrine which is able to maintain itself not in clear light but only in the dark, will of necessity lose its effect on mankind, with incalculable harm to human progress. In their struggle for the ethical good, teachers of religion must have the stature to give up the doctrine of a personal God, that is, give up that source of fear and hope which in the past placed such vast power in the hands of priests. In their labors they will have to avail themselves of those forces which are capable of cultivating the Good, the True, and the Beautiful in humanity itself. This is, to be sure, a more difficult but an incomparably more worthy task.[658]

All of this, of course, reflects on Einstein's moral life. Instead of allowing the awe-inspiring complexities of the universe to bring him to the foot of God's throne in humble submission, science becomes the insulation to keep him away from God, so that in the end Einstein becomes his own god. In 1930 he wrote the following:

> When one views the matter historically one is inclined to look upon science and religion as irreconcilable antagonists, and for a very obvious reason. The man who is thoroughly convinced of

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creatures, or has a will of the type of which we are conscious in ourselves. An individual who should survive his physical death is also beyond my comprehension, nor do I wish it otherwise; such notions are for the fears or absurd egoism of feeble souls" (*The World As I See It*, Citadel Press, 1956, 1984, p. 5); "The Jewish God is simply a negation of superstition, an imaginary result of its elimination" (*ibid*., p. 91).

[657] Albert Einstein, *The World As I See It*, translated by Alan Harris, 1956, 1984, p. 29.

[658] Albert Einstein, *Ideas and Opinions*, 1984, p. 48.

> the universal operation of the law of causation cannot for a moment entertain the idea of a being who interferes in the course of events—that is, if he takes the hypothesis of causality really seriously. He has no use for the religion of fear and equally little for social or moral religion. A God who rewards and punishes is inconceivable to him for the simple reason that a man's actions are determined by necessity, external and internal, so that in God's eyes he cannot be responsible, any more than an inanimate object is responsible for the motions it goes through. Hence science has been charged with undermining morality, but the charge is unjust. A man's ethical behavior should be based effectually on sympathy, education, and social ties and needs; no religious basis is necessary. Man would indeed be in a poor way if he had to be restrained by fear of punishment and hope of reward after death."[659]

Conclusion

In closing this chapter, let us be certain to add that, in spite of the harsh criticisms we levy against the conclusions of modern scientists, we are not disparaging their intellects or their place as human beings. The halls of science house some of the most intelligent men this world has ever known. One glance at their massive treatises and equations tells us that we are not dealing with ordinary human beings. Most of these men are geniuses. But the sad fact is, it doesn't matter how smart you are, how many books you've written, what chairs of science or mathematics you hold, how many Nobel prizes you've won, or how popular you are. The difficult but undeniable truth is: if you start out with the wrong premise, you are going to end up with the wrong conclusion. With the wrong answers, as the saying goes, 'you may be able to fool some of the people some of the time, but you cannot fool all the people all of the time.' The advantage this work has is that it starts with the right premise, for it obtained that premise from divine revelation and was not afraid to accept it at face value, and now all that is left is to work backwards, as it were, and verify the premise by using the very tools with which modern man prides himself: science, math, and logic. As Scripture assures us: "But thou hast arranged all things by measure and number and weight."[660]

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[659] Albert Einstein, "Religion and Science," *New York Times Magazine*, November 9, 1930; as originally stated in *The World As I See It*, p. 27. Einstein adds: "Our actions should be based on the ever-present awareness that human beings in their thinking, feeling, and acting are not free but are just as causally bound as the stars in their motion" (Statement to the Spinoza Society of America, Sept. 22, 1932. Einstein Archive 33-291, cited in *The Expanded Quotable Einstein*, p. 209).

Perhaps there may be a few who will see the truth, yet the world's scientists, by and large, are the last on our list of concerns. We do not expect those whose careers, salaries, and Nobel Prizes depend upon supporting Copernicanism, Evolution, and Relativity to their dying day, will ever consider that the Earth is motionless and in the center of the universe. As noted earlier, an immobile Earth in the center of the universe would destroy all three legs of *Scientism's* stool in one fell swoop. Sadly, rather than prompting such men to lift their eyes in awe, the information gathered herein may only serve to harden their hearts even more, and thus serve as a testimony against them when they meet their Maker. As such, our book is geared to the next generation of scientists and theologians who are tired of the cosmological shell game that has been going on for the last several centuries.

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[660] Wisdom 11:20 [Douay-Rheims: 11:21].

"Next in line are the scientists…they feel that they are the only men with any wisdom, and all other men float about as shadows….They can never explain why they always disagree with each other on every subject…knowing nothing in general they profess to know everything in particular."

Desiderius Erasmus[661]

"How would this Marxist revolutionary emotion and vision be expressed…in the mind of a young 'revolutionary genius' in physics? The emotions that gave rise to sociological relativity might then seek to express themselves in a physical relativity; transposed and projected upon the study of the physical world, they would issue in an overthrow of absolute space and time, and in a conception of the relativity of length and time measurements to the observer's state of motion."

Lewis Samuel Feuer[662]

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[661] Erasmus' *The Praise of Folly*, trans., J. P. Dolan, p. 142.

[662] L. S. Feuer, "The Social Roots of Einstein's Theory of Relativity," *Annals of Science* 27 (1971), as cited by Max Jammer in *Einstein and Religion*, p. 30.

Appendices

Appendix 1

Philosophical and Scientific Ruminations of Martin Selbrede

As Recorded for the Scientific Documentary, *The Principle* in 2012

As Written in the 1994 Paper "Geocentricity's Critics Refuse to do Their Homework"

Interviewer: Let me just close by talking about how you became a geocentrist, and the theological aspect of your thinking, because I think for most of the geocentrists we've talked to, the process began as a theological process, and based on the idea that one God is responsible for all truths, scientific and theological, that having accepted it as a theological datum, they were able to expect that they would find correlation and support from the scientific evidence. Is this the way it worked for you or did it work some other way?

Selbrede: I was challenged in the area of geocentricity from a theological point of view, and the question was this particular article by Richard Green that was published in a journal in 1982, did this article darken the door and discredit the journal by even mentioning it? In fact, he went out of his way to say perhaps you find it astonishing that I even bring up this question, but he directed me toward, or any other reader for that matter, toward the groups that would analyze parallax and rotations and densities and things of this order. The actual science. And I had enough training in relativity theory to say, well, yes, geocentricity is as valid as heliocentricity. The mathematics should work out, and the dynamics actually work out.

Then of course I've been skeptical of Einstein to begin with for quite a while, so as I worked through the implications I saw not only was there a theological case, but the scientific case is actually being understated in a gross matter and there was far more to be said for the geocentric model than we would normally get. The problem is you have to cross a barrier, which is that resistance barrier, not only personally, but realizing, okay, now what's my reputation going to look like the second I adopt this position.

And it's not pretty. Geocentrism is not pretty, as we say, because you're going to get a lot of heat. You might get heat for a legitimate reason that you don't know what you're talking about and you cannot defend your position, either scientifically or any other way. Or you're going to defend your position quite well and probably catch even more heat, because now you're a dangerous individual, a player that is actually upturning the apple cart if you will in a way that is going to help see, if you will, a reformation in the physical sciences. Because astronomy is ripe for a new Copernican revolution, perhaps back in the other direction.

Interviewer: Martin, you obviously were headed for great things in science, I mean, you attended this seminar at Cal Tech. You were exposed at a very young age to the teachings of some of the giants in the field, why is it that you never pursued a degree in this area?

Selbrede: I don't know.

Interviewer: When it comes to dark matter, I am not somebody that knows the science. My whole concern is we're sitting here looking for something that we haven't found and we're spending millions and millions and dollars on it, if not billions, what is your stance on that? Especially with the economy the way it is worldwide right now?

Selbrede: I think it's a fool's mission to look for dark matter. I don't believe they're going to find it. I think the search for dark matter is a fool's mission. The only reason the people believe that dark matter exists is that the existing philosophies require it. It's not scientifically required at all. The problem is, of course, that we have existing commitments to the age of the Universe, that the Universe is as long as age is an issue, 16 to 20 billion years since its alleged origin back in time primeval, then the dispersion of velocity, dispersion of all these objects doesn't make any sense. Things shouldn't hold together. They should have all fallen apart. So they need to find out how to keep this entire ensemble together for as long—

The search for dark matter is almost certainly a fool's mission. On several accounts. The only thing that drives that is to try to justify the huge ages that are assumed for the Universe. If those ages are abandoned, you don't need that dark matter, things are looking exactly the way they're supposed to be looking right at the moment for a very new creation. Now, this creates all sorts of issues outside the scope of what this film is about, but the reality is that it is a philosophical commitment that drives the search for dark matter not a scientific commitment. It's simply to justify the long ages of the Universe's existence. And if you drop that and regard – look at just what you see, then you simply say okay the reality is the Universe is not nearly as old as it's thought to be.

Interviewer: With that, you're saying it's philosophical for the search for dark matter. Let's go to something that's been happening with this documentary. We're being told that we should not question dark matter. We should not question the Copernican principle by mainstream because of science, yet they're spending that money looking for something that you're saying is a philosophical search.

Selbrede: What modern science is all about is to circle the wagons around the existing paradigm, and protect it at all costs, because that's what's being propounded by the institution of learning. So dark matter, not having a bunch of commitment behind it, is now the new [Sugalith?] for science. And it's going to stand or fall on this search for something that we've never seen, isn't anywhere near us, and cannot be measured in anything other than by inference for things that are like, I mean, a thousand of light years away.

It is so fundamental, 99% of the Universe is made out of it, and we don't have a single scarp of it here. So this is wishful thinking on the most dynamically monstrous scale, and how it has come to dominant science and the people involved in science. And politicizing science for that matter which how can that lead to good science? When science is politicized? It never does in any other field, why would politics make science run better? And get us better answers? It doesn't. In fact, it can't, because politics is the wrong thing driving the scientific enterprise. It only exists as a doctrine because we have other commitments philosophically that have to be protected, so that we can reference an existing world view that is under stupendous fire from the facts.

Interviewer: We've interviewed a lot of geocentrists and when learning about everything, learning about the geocentric view was mainstream years ago, and now we're trying to come back and say, "You know, this is the way that things are going, and you guys need to look at it." But you're getting punched in the face, let's just say, by science. What do you feel about that? That this was a mainstream idea and now it's not and you're fighting for a place at the table. That's exactly what Bob's saying, he's just fighting to be heard.

Selbrede: Right. What we're hearing is pay no attention to the man behind the curtain, and of course we're drawing back the curtain exactly on what modern science actually teaches. I don't mind being punched in the face by science, I mind being punched in the face by a scientist who is hiding from science and they don't want that to be known. They want to pull the curtain back and say, "You have to trust us because we're the experts, and you don't know anything. So if you want to stand toe-to-toe with us, then we are also the gate keeper. We'll determine who gets a doctorate in astrophysics. And so if someone who wants to get a doctorate is a geocentrist, they probably will have to hide that commitment of theirs as a geocentrist until they get their doctorate. And then they'll be discredited as a doctorate person who needs to have their doctorate rescinded and revoked. Because that's how violent things do get in academia. There is plenty of suppression going on at the academic level. And it's an ugly thing, and science is not served by it. There is a legitimate protection of a paradigm and an illegitimate protection when people are simply circling the wagons because they see that someone is knocking over their rice bowl, and science has now become more of a human enterprise, and unfortunately that brings in the ethical implications of science. And we're not – that's a whole other area of how well do we treat other scientists when they have now take an unpopular position. Or when they challenge the existing model, because now people are upset. They take it personally and they go on the attack. And whole institutions go on the attack.

The Velikovsky Affair, for all that Velikovsky had wrong, he certainly stirred the pot. And the American Academy for the Advancement of Science didn't look that good when they went after that fellow. There was the challenges of whether he should even be allowed to print his books. America is a place where controversial ideas can be printed, not where you say, "Stop the presses or I will not allow Doubleday to print any more university textbooks because I want to suppress that book from being released."

This same approach is prevailing today, about let's go ahead and suppress the geocentrists. Let's not give them the time of day. Let's write them out of the debate, and let's do everything we can to scorn on them. In fact, it's the same strategy that was directed against creationists in the '80s is, "Don't give them the time of day, don't debate them, just heap scorn and take the kid gloves off and treat them dirty." And geocentrists made – and in fact, we're such a small group, I don't think we're going to get enough attention until perhaps this film comes out, and as we make more of a

bigger bust, then they're going to have to literally go to war with us over science itself.
And it'll be equations. The right form of this debate will be scientific one. We're willing to sit at the table. And if they do then I think that's for the betterment of science, but if they don't, then it's going to be volleys across the valley and eventually the facts will win. Because you can only hide from the facts so long. I think that's going to be their problem more than mine. I'm the one bringing them up, they're the ones trying to run from the science, I'm the one trying to bring up their own science back in their face and saying, "Look, this is what you men have been writing for the last two centuries. Here I've documented it, what do you say?"

So this is an endemic problem, because people do science, it's not just done by robots. It's not done by Spock, it's done by someone who has an optional commitment to what they're writing, and they do take it personally.

I believe that if I'm not living for the truth, then I'm simply propagating a fraud, either by default or by enabling it. I don't intend to enable these falsehoods, so the truth is of interest to me. And I think it's ultimately of interest to the human race what the truth is about these matters.

Look, if I'm not living for the truth, then I'm simply propagating a fraud, either by laziness or inaction. So that's what gets me going in the morning, is that these issues need to come out. The human race is in need of the truth on this matter, and it's time for the darkness to pass and the truer light to shine on it.

Interviewer: If your view is right, what do you think that we should do as a human race that we're destroying this Earth, and if we're that special, what is it that we need to do as a human race to fix it?

Selbrede: I think this is one of the great catastrophes of the Copernican Principle, is the notion that we're just an insignificant speck rotating on a insignificant island in the Universe far away from anything that's significant. But if we are significant, and if there's something special about our home, this planet, then those concepts have tremendous implications, and we need to be then focused on our commitments as stewards over the creation that we have to work with.

So I think it changes the entire picture philosophically for humans. So the science now actually drives philosophy, as opposed to the other way around, which we're seeing today. And I think that's huge. We've got to get away from the Copernican principle and the notion that man means nothing, from just a meaningless molecule to a human being that's in a special location for presumably a special purpose, and therefore men are driven by their purpose, and they can see themselves in a very different light than the fact that they are simply chaotic blobs that no one really cares about.

Interviewer: I wanted to get your opinion about the multiverse as juxtaposed with the Copernican Principle. What do you feel about the multiverse, what do you think about that?

Selbrede: The multiverse is an attempt to take quantum mechanics and give every possible answer as a yes. Each Universe has a different Universe. There's a geocentric Universe in the mutliverses, there's a heliocentric one, there's a Jovicetnric – ones that are Jupiter by this hypothesis.

The multiverse is an attempt by certain quantum theorists to try to have their cake and eat it. In other words every single event can go one or two different directions, and that creates a random Universe. It's called Space Time Foliation, we get whole new levels of space time in each Universe, and then it spins off from the existing one and then it goes its own route. So you can have nice Martin and evil Martin in another Universe. You can have a film on heliocentricity being defended in another Universe because everyone is a geocentric possibly. Of course this is, again, quantum mechanics way of saying, "We can have every possibility covered." That means there is no serious, single reality. And it's simply because quantum mechanics has already been the way to get anything you want. It's premised on all sorts of false notions to begin with. The assumptions are hazardous to your scientific health in my opinion. Yes, it can get all sorts of answers predicatively, but it doesn't provide the mechanisms, and it doesn't determine things properly. So really it's a philosophical sleight of hand, it's a way to generate all sorts of metaphysics out of these equations, but the questions are simply mathematical constructs. They don't represent the reality that we deal with.

In such another multiverse it would be good to kill people and murder, because ethics presumably would also be different in the other Universe. If they're the same, how did they get over to the other side. Plus you have to question the point about can one Universe steal from another? White holes are apparently a link between one to another, so the Paul Universe can steal from the Peter Universe, and vice versa. What's being crossed between though? How do you get the fundamental laws of nature to actually fall together properly, like conservation of mass and energy, these things that we treat as the most fundamental, hallowed aspects of physical law, that then are put on the slicing block with this notion. So it's simply a sleight of hand to try to avoid answering questions, because saying there's many Universes, doesn't really answer anything, does it? Because it doesn't deal with the Universe we are in, assuming it's even true.

By the way, this polyverse or multiverse really means that you have a pre-existing world view that says the existing Universe is not unique. It's also insignificant. So the basic premise of the multiverse is that our Universe is also insignificant because it's one of zillions of constantly populating, bubbling-up new Universes, simply because someone made a different decision in one Universe and it split off to another one, and that's happening zillions of times every second. So it's an incoherent view in many respects.

Interviewer: What about Bernard Carr? Was it Bernard Carr who said it's the multi Universe or God.

Selbrede: I would agree that the alternative is between a multiverse and God. Because if there's a Universe, then there's the one Universe that God created. And it's not a self-creating thing at all, it presumably does in fact have a creator and man has to deal with that fact, that he is someone's property, and that person may have property rights in us and expect certain things of us and have a purpose for us, and more to the point, we'd be accountable if we're created. I think a multiverse allows us to slip by all accountability, therefore it is appealing to natural man to want a multiverse because it makes man off the hook on his ethical conduct. You can try to re-import it back in, us it's not basic to the Universe, and you don't confront the face of God in a multiverse. You're just the result of a mathematical equation splitting an infinitely long time, versus the handiwork of a creator.

Geocentricity's Critics Refuse to Do Their Homework

By Martin Selbrede

In a surprising turn of events, Dr. Gary North hired Dr. Michael Martin Nieto, theoretical physicist at Los Alamos National Laboratory, to analyze alleged fatal flaws and defects in geocentric cosmology from the standpoint of an astrophysicist. Dr. North paid Dr. Nieto for the resulting essay, entitled "Testing Ideas on Geostationary Satellites," which is incorporated as the bulk of the publication bearing the superscription, "Geocentrism: An Astrophysicist's Comments."

Dr. Nieto interacted with virtually no relevant geocentric material, although it was not only available to Dr. North, but actually forwarded to him in 1992. Dr. North saw fit to return the most technically-oriented and complete videotaped lecture on geocentricity available at that time, without having ever watched it. The video provided up-to-date technical references in answer to Dr. North's many challenges, but he refused to view it. He could have saved himself the money, and Dr. Nieto the trouble, had he not inflicted such blindness upon himself. The response to Dr. Nieto is contained in that video, and we need merely rehearse it here to refute Dr. Nieto's and Dr. North's papers. The fact that Dr. North held that very video in his hands and yet refused to view it, reflects a tragic breakdown of academic and intellectual integrity on his part.

The great irony of Dr. Nieto's essay is his complete reliance on Einstein's General Theory of Relativity. The irony obtains from the fact that general relativity stipulates that any observer can consider himself to be at rest – and that solving Einstein's field equations for his position will properly and satisfactorily describe all phenomena observed from that vantage point. When Drs. North & Nieto assert that if the earth were at rest, geosynchronous satellites would necessarily fall down, they are asserting that general relativity is completely false. Since Dr. Nieto uses 2 of his 7 pages to air alleged experimental proof for general relativity, we observe that a kingdom divided against itself cannot stand, and that Dr. Nieto thereby destroys his own arguments.

In fact, Dr. Nieto appears to be completely unaware of the well-documented key doctrines of general relativity, both as presented by Einstein and Mach, and developed subsequently into our own decade. This failure of scholarship (surprising, since the essentials are taught in freshman-level courses in physics) has led Nieto into multiple errors.

North and Nieto are searching for the mystical geocentric force that holds up geosynchronous satellites, preventing them from falling to the earth given the geocentric hypothesis that they are not orbiting objects.

"Where is this force?" they ask, for they have searched and found it not. So they appeal to their readers to search as well and see for themselves there is no such force, just as the Pharisees challenged, "Search, and look: for out of Galilee ariseth no prophet" (John 7:52). Had the Pharisees glanced at Isaiah 9, they could have spared themselves an embarrassing gaffe. Had Dr. Nieto reviewed Einstein first, he could have done likewise.

The urge to hide the geocentric force acting on the geosynchronous satellite from his readership resulted in the following error by Nieto. Says he, "...one sees that there is no explicit mathematical theory as to why the satellite would stay up there if the universe were geocentric. The authors postulate that maybe there is a sphere of matter (no good, they realize, there is no force inside a sphere of matter), or then maybe there is a ring and maybe this could account for it. They speculate. But they do not show." Actually, we did show, but Dr. North didn't watch.

Einstein taught that there is a force inside a sphere of matter that is in motion. He wrote plainly to Ernst Mach on June 25, 1913, "If one accelerates a heavy shell of matter S, then a mass enclosed by that shell experiences an accelerative force. If one rotates the shell relative to the fixed stars about an axis going through its center, a Coriolis force arises in the interior of the shell, that is, the plane of a Foucault pendulum is dragged around." Geocentrists have never denied the Gaussian proposition that there is no net force inside a stationary shell of matter - but the distinguishing feature of geocentricity is the daily rotation of the universe around the earth. How did Nieto and North miss it? By using return mail.

The magnitude of the force (usually discussed under the heading of "dragging of inertial frames") is cited in many references. Misner, Wheeler & Thorne, in their tome *Gravitation*, pp. 547, quantify the rotational drag by "simple dimensional considerations" and propose that wf, must be identical with ws or, namely, that the angular velocity of a Foucault pendulum equals the angular velocity (speed of rotation) of the stars (i.e., the rest of the universe) (ibid, pg. 548). These well-respected authors (Kip S. Thorne is Cal Tech's black hole and general relativity expert; Wheeler & Misner taught at Princeton, Cal Tech and Oxford) approvingly cite the 1918 work of Thirring (pg. 547) in connection with this force and its computation.

This last circumstance is doubly ironic, since Dr. Nieto's final footnote begins, "There is a gravimagneto effect related to the Earth's rotation, which amusingly draws upon the work by Thirring cited by [Dr. John] Byl:" Dr. Nieto's faulty understanding of basic relativity theory could have been remedied by checking the work by Thirring. Hans Thirring begins by citing Einstein's 1914 paper. Einstein defines K as a Galilean-Newtonian coordinate system, and K_1 as a coordinate system rotating uniformly relative to K. Since this directly represents the earth (K_1) and the universe (K) in Dr. Nieto's antigeocentric cosmology, I will substitute these identifications for K and K_1 in italics in Einstein's text to make Einstein's position clear to every reader:

> Let the earth be a coordinate system rotating uniformly relative to the universe. Then centrifugal forces would be in effect for masses at rest in the universe's coordinate system, while no such forces would be present for objects at rest with respect to the earth. [The geosynchronous satellite is precisely such an object, at rest with respect to the earth, but viewed as having a centrifugal force acting on it with respect to the universe - MGS.] Already Newton viewed this as proof that the rotation of the earth had to be considered as `absolute,' and that the earth could not then be treated as the `resting' frame of the universe. Yet, as E. Mach has shown, this argument is not sound. One need not view the existence of such centrifugal forces as originating from the motion of the earth; one could just as well account for them as resulting from the average rotational effect of distant, detectable masses as evidenced in the vicinity of the earth, where the earth is treated as being at rest.

In quite precise language, Einstein taught that the centrifugal force on an object in the earth's rest frame (the condition satisfied by the hovering geosynchronous satellite) is inadmissible as evidence of the rotation of the earth, for in the earth's frame that force arises from "the average rotational effect of distant, detectable masses." This 1914 teaching of Einstein is rather old news – and it remains inconceivable that Nieto would cite it, "amusingly enough," without reading it. Or is there a tragic pattern here?

Thirring observed in his opening paragraphs that the complete equivalence between the reference frames, explaining such phenomena as the geosynchronous satellite or Foucault pendulum equally well in a geocentric reference frame, is secured by definition by Einstein's 1915 work: "the required equivalence appears to be guaranteed by the general co-variance of the field equations." This is what geocentrists mean when they assert (much to Dr. North's disdain) that the mathematics is the same for the heliocentric and geocentric models: Einstein's field equations are structured to supply the necessary upward force on the geosynchronous satellite in a geocentric as well as a heliocentric framework. In fact, the only reason Thirring wrote his paper was because the boundary conditions of Einstein's paper were geared for a finite universe, so that Thirring set forth, in his own words, "the mathematical development of a rotational field of distant masses for a specific, concrete example." After ten pages of tensor analysis, Thirring summarizes: "By means of a concrete example it has been shown that in an Einsteinian gravitational field, caused by distant rotating masses, forces appear which are analogous to the centrifugal and Coriolis forces." Hard again to imagine Dr. Nieto's amusement in citing in his favor a source, even second-hand, that negates his position. Harder yet to imagine Dr. Nieto rejecting Thirring's argument, since it simply (and ably) develops Einstein's own stated position.

Einstein's position has not lacked for continued, and contemporary, treatment by the world's top relativity scholars. Another key (and, in fact, decisive) reference cited in the video North refused to view was taken from the journal, General Relativity and Gravitation, Volume 21, No. 2, 1989, pgs. 105-124. Professors 0. Grön and E. Eriksen, in the article Translational Inertial Dragging, take up, again, the issue of what forces arise within a spherical shell of matter. (Recall that Dr. Nieto wrote, "there is no force inside a sphere of matter.")

Grön & Eriksen inform us that "The rotational inertial dragging effect, which was discovered by Lense and Thirring, was later investigated by Cohen and Brill and by Orwig. It was found that in the limit of a spherical shell with a radius equal to its Schwarzchild radius, the interior inertial frames are dragged around rigidly with the same angular velocity as that of the shell. In this case of "perfect dragging" the motion of the inertial frames is completely determined by the shell." (pg. 109-110).

Intriguingly, the authors point out that "with reference to Newtonian mechanics we talk of inertial force fields in accelerated reference frames. However, according to the general principle of relativity, we may consider the laboratory as at rest. We then talk of gravitational dragging (acceleration) fields. The concept of 'inertial forces,' which may be regarded as a sort of trick in Newtonian mechanics, is thereby made superfluous." What is fascinating here is the recognition that the Newtonian centrifugal force due to inertia (of which Dr. North is so fond) is a fictitious force, and is "a sort of trick." One would have expected the geocentric model of the geosynchronous satellite to be the one filled with tricks and fictional forces, but such is not the case. (The authors intend no derogation of fictitious tricks in the Newtonian case, while buttressing the claim that geocentricity posits actual rather than fictitious forces to account for the behavior of objects such as geosynchronous satellites.)

This is explicitly stated on page 113, where G&E cite C. Møller "in his standard [1952] textbook on general relativity," from chapter 8: "Einstein advocated a new interpretation of the fictitious forces in accelerated systems of reference. The 'fictitious' forces were treated as real forces on the same footing as any other force of nature. The reason for the occurrence in accelerated systems of reference of such peculiar forces should, according to this new idea, be sought in the circumstance that the distant masses of the fixed stars are accelerated relative to these systems of reference. The ‘fictitious forces’ are thus treated as a kind of gravitational force, the acceleration of the distant masses causing a `field of gravitation’ in the system of reference considered. Only when we work in special systems of reference, *viz*., systems of inertia, it is not necessary to include the distant masses in our considerations, and this is the only point which distinguishes the systems of inertia from other systems of reference. It can, however, be assumed that all systems of reference are equivalent with respect to the formulation of the fundamental laws of physics. This is the so ¬called general principle of relativity.”

This quote is important on two counts. (1) The italicized sentence (emphasis apparently in Møller’s original textbook) is precisely what Dr. Nieto denies in his argumentation, namely, the general principle of relativity. But on what does Dr. Nieto base his arguments against geocentricity? General relativity!

But count (2) is equally telling: Møller tells us that the only reference frame in which we can exclude consideration of the distant masses of the galaxies is in “systems of inertia,” which G&E more carefully define as “frames of reference in which the cosmic mass has no observed rotation or translation acceleration.” By this definition, the earth does not fulfill the requirement for being a system of inertia, since the heavens are observed to rotate around it. Therefore, Møller alerts us that we may NOT omit the rest of the universe in deriving the forces acting locally on the earth. Geocentrists assert as much, consistent relativists (*e.g*., Fred Hoyle) assert as much, but inconsistent or forgetful relativists (*e.g*. Nieto) fail to do their homework before taking up the issue.

Grön & Eriksen develop the consequences of Einstein’s position to the hilt on pages 117-118 with an ironclad example: “As an illustration of the role of inertial dragging for the validity of the strong principle of relativity, we consider the Moon orbiting the Earth. As seen by an observer on the Moon both the Moon and the Earth are at rest. If the observer solves Einstein’s field equations for the vacuum space-time outside the Earth, he might come up with the Schwarzchild solution and conclude that the Moon should fall toward the Earth, which it does not. So it seems impossible to consider the Moon as at rest, which would imply that the strong principle of relativity is not valid.

> “This problem has the following solution. As observed from the Moon the cosmic mass rotates. The rotating cosmic mass has to be included when the Moon observer solves Einstein’s field

> equations. Doing this he finds that the rotating cosmic mass induces the rotational nontidal gravitational field which is interpreted as the centrifugal field in Newtonian theory. This field explains to him why the Moon does not fall toward the Earth."

This is the decisive answer to Dr. North and Dr. Nieto. The Moon always shows the same face to the Earth, so that from the point of view of the Moon, the Earth is hovering 240,000 miles above it. In this picture, the Earth is to the Moon, what a geosynchronous satellite is to our Earth. The hypothetical Dr. North on the Moon solves his equations and wonders, "What holds the Earth up? Why doesn't it fall down here?" And Grön and Eriksen have provided the answer, in complete consistency with the work of Einstein (1913, 1914, 1950), Thirring (1918, 1921), Møller (1952), Misner, Wheeler, Thorne (1973), Brill and Cohen (1966, 1968) and Orwig (1978). Which is only natural, since it is unthinkable that Einstein's disciples would break with him on the central tenet of his general theory. Whereas Dr. Nieto seems to recognize the element of curved spacetime in general relativity, he has failed to grasp the general principle of relativity itself, from which the subsequent geometric model flowed. In fact, he has (inadvertently, I would hope) lashed out at it.

In passing, note that the plane of rotation of the cosmic mass in G&E's example is equatorial for the Moon – general relativity provides for explaining such geosynchronous phenomena only for equatorial satellites. Dr. North wrongly assumes that in the geocentric model one can place geostationary satellites over North Dakota, whereas the geocentric literature has repeatedly taught that the field equations arising stable geostationary satellites only over the equator, and at the same prescribed height as that indicated by the Newtonian methods Dr. North favors. This has been asserted in books, in journals, on audiotapes, and videotapes. You'd have to try real hard to miss it.

While on the subject of Einstein and Thirring, let us examine Dr. Nieto's final footnote: "There is a gravimagneto effect related to the Earth's rotation, which amusingly draws upon the work by Thirring cited by Byl. Attempts will be made to measure this effect with a gyroscope orbiting about a rotating earth (Schiff gyroscope experiment) and by two satellites (LAGEOS I and III) orbiting about a rotating Earth in complementary orbits. This is a prediction, whose test will hopefully come about this decade."

Reading this somewhat flippant note, the certainty of the Earth's rotation is flatly assumed as proven, and about to undergo additional, if superfluous, proof. It is made to appear that Dr. John Byl erred by quoting from a source that is being used to develop an experimental proof of the earth's rotation! But all is not as it seems in footnote 13.

The fundamental reference to experiments like this is found, again, in Misner, Wheeler & Thorne's *Gravitation*, pages 1117-1121, where the experiment alluding to Nieto's complementary satellite orbits (one polar, the other equatorial) is set forth in detail. MW&T tell us that "the Earth's rotation `drags' the local inertial frames along with it. Notice that near the north and south poles the local inertial frames rotate in the same direction as the Earth does (Ω parallel to J), but near the equator they rotate in the opposite direction (Ω antiparallel to J; compare Ω with the magnetic field of the Earth!)" (page 1119). By sending satellites in orbits 90 degrees apart, scientists can maximize the effect they are trying to measure, which is very microscopic indeed (0.1 seconds of arc per year). But Nieto's use of this argument falls to the ground, since the physics being described here are those local to the gyroscope. Whether or not the earth is motionless, the experiment yields the same result. In fact, the very wording of the authors' argument deflates Dr. Nieto's point, since they specify that the motion is relative between the Earth and the distant galaxies. The force that the satellite experiment will be measuring is precisely the kind of force (inertial frame dragging) that general relativity scientists affirm holds up geosynchronous satellites when the earth is taken to be at rest. So, the amusing part of Dr. Nieto's footnote 13 is how badly it appears to have backfired.

If it be objected that a 1973 book, definitive tome though it be, is somewhat dated in dealing with the 13th footnote, the literature is still rich in more recent references. In *General Relativity and Gravitation*, Vol. 20, No. 1, 1988, Cerdonio, Prodi and Vitale published an article entitled "Dragging of Inertial Frames by the Rotating Earth: Proposal and Feasibility for a Ground-Based Detection," pgs. 83-87. The kind of hardware that Dr. Nieto has in mind is there described in depth, where "the effect of rotation results in a net magnetization of the [instrument's ferromagnetic] rod" (pg. 85). The resulting magnetic flux is measured by a device known as a SQUID. Yet, throughout the article, general relativity is assumed, and relative motion is affirmed. The very effect itself is described thus: "The Lense-Thirring field due to the rotating Earth is locally equivalent to a rotation in respect to distant stars..." Another expression is "the time average of the Earth's rotation with respect to distant stars." The choice of coordinate system is arbitrary, and the field mathematics follows after the preference of the physicist. Consult, by way of comparison, the citations of Thirring discussed earlier, on which this paper is dependent.

In short, we have here Thirring cited against Thirring, Einstein cited against Einstein, and general relativity cited against general relativity. Dr. Nieto deliberately and directly undermines his own physics, and his arguments are manifestly self-contradictory. Consistent relativists have never been hostile to geocentricity. Dr. Fred Hoyle pointed out that had the trial of Galileo been held after Einstein published his general theory, it would have resulted in an even draw by mathematical and physical necessity. This is the legacy of general relativity: the overthrow of absolute reference frames, and the democratization of all coordinate systems.

Let it be clearly understood that the presentation of general relativity's teaching on the geocentric model presented herein is central, not peripheral or obscure, in Einstein's theory. It was plainly presented to this author when he learned the fundamentals of general relativity and geometrodynamics at the California Institute of Technology at the age of 16 (as a research fellow for the 1973 California Junior Science & Humanities Symposium, under the supervision of Dr. Kip S. Thome and his associates - and often studying, in fact, from the galley proofs of Gravitation as it was being completed for publication). We can therefore safely rule out the idea that Dr. Nieto's training somehow glossed over this key proposition, in light of the fact that it is basic to Einstein's theory, and that Dr. Nieto freely cites references from general relativity's body of extant literature. He even indicates that he is actively seeking to improve upon Einstein, which would, presumably, imply some mastery and understanding of the theory one is attempting to supplant.

Therefore, Dr. Nieto's multiple citations from the world of general relativity constitute academic suicide so far as this particular debate is concerned. A geocentrist could have easily quoted the selfsame references as Dr. Nieto did, but in so doing remained consistent with Einstein. (There are, in fact, a number of geocentrists who base their scientific understanding of the geocentric model directly upon general relativity, at least one of which has conveyed this clearly and concisely to Dr. North.)

To summarize: it is impossible to launch an attack on geocentricity on the basis of general relativity, by definition. Proof of a moving earth is simultaneously proof that general relativity is a myth.

This means that Dr. Nieto's analysis is shot through with factual errors in regard to the primary force of his presentation. Some of his errors are relatively innocuous, e.g., his description of Kepler's theory as involving concentric spheres "within which were inscribed regular polygons." (Kepler used Platonic solids and not flat polygons.) Unfortunately, most of the errors (factual, logical, and scientific) are simply fatal.

Dr. Nieto, however, has also evidenced poor research in setting forth geocentricity's distinctives. He asserts at least six times that geocentricity has failed to predict certain phenomena that modem science has correctly predicted. These alleged failures earn geocentricity a demotion to the status of an antirational dogma. Through ignorance of geocentric physics, Dr. Nieto imposes a Procrustean bed on those he criticizes – tantamount to stuffing words into the mouths of geocentrists. The predictive power of geocentricity, and its more comprehensive analytic range, will be addressed below.

First, however, consider Dr. North's accusation that modern geocentricity has failed to produce fruitful results. Citing the parable of the fig tree, wherein "Jesus allowed it only four years of fruitlessness before cutting it down," North finds geocentricity long overdue for immediate termination. His arbitrary time-frame reveals a shallow view of modem physics.

Galileo himself learned that merely setting forth a more elegant and attractive geometry for orbital kinematics was inadequate to prove his heliocentric model: he had to provide a complete, new theory of dynamics to support it. This work, undertaken by one of the great intellects of the period, was decades in the making. The formalism later received its capstone in the work of Newton. This development spanned more than a century of time. Dr. North's "fig tree" view finds its analogue in the vitriolic attacks launched against Galileo by his enemies, whose motivations were political and personal.

The new dynamics of Einstein were born in the work of mathematician Georg Riemann, whose work on space curvature appeared so far removed from any known practical application that it appeared completely useless. Yet, gravitation is now described using his tensor notation, which Einstein incorporated into the heart of his general theory. With Einstein came a new dynamical theory, geometrodynamics, with spacetime geodesics replacing outdated Newtonian trajectories. This revolution took the better part of a century, from the laying of the mathematical foundations in the mid-19th century to the completion of this towering edifice of 20th century physics.

The case is no different with geocentric science: it, too, must develop a brand new dynamical theory to support its description of the behavior of the heavens. Unlike the peaceful development of Einstein's theory, the geocentric model's slow codification is being undertaken under tempestuous circumstances, in the face of ridicule, contempt, and self-indulgent scorn, yet propelled forward by laborers operating near their personal limits of physical stamina. Yet the work goes forward, and should be allowed the time that was accorded the preceding revolutions to bear their fruit. A preliminary overview of progress to date, giving a glimpse of the dynamical theory being presently developed by modem geocentric scientists, is herein set forth. Where the discussion touches on Dr. Nieto's concerns and challenges, the connection will be pointed out. (Keep in mind that not all geocentrists will agree with every detail of the following summary - it only purports to be representative of the dominant strains of thought among top geocentric scholars.)

Gravity and Related Matters

One would think that the only viable theories of gravitation worth considering were Newton's and Einstein's, given the substance of Dr. North's and Dr. Nieto's critiques. This gross oversimplification merely misleads the unwary reader, historically and scientifically. Newtonian gravity received competition from the LeSagean theory of gravity, and the LeSage hypothesis even received the theoretical attention of Lord Kelvin ("On the Ultramundane Corpuscules of LeSage," Royal Society of Edinburgh Proceedings, pgs. 577-589, 1871). The LeSage theory is a physical theory of gravitation, meaning there is an actual, understandable physical reason why gravitation exists and can be felt (unlike abstract notions such as action-at-a-distance and curved spacetime). The theory has undergone important revisions in the hands of geocentrists over the last decade, but the fundamental idea is retained.

George-Louis Le Sage developed "his" theory in the late 1770's (the work was almost certainly plagiarized). He postulated that the universe is filled with countless infinitesimal particles, which he termed ultramundane corpuscles. These corpuscles are in extremely rapid motion, analogous to molecules in a gas, and are colliding continually with material objects from all directions, so that a net pressure is applied to all objects within this kinetic "ocean" of ultramundane corpuscles.

In the case of a spherical mass in the middle of this corpuscular flux, the net force on the mass is zero, since the pressure is applied to it equally from all directions. However, in the case of two spherical objects near each other within this flux, the one sphere will block some of the corpuscles from colliding with the other, and vice versa. The objects shield one another from a portion of this flux, as determined by their mass and separation, such that there are more corpuscles pushing them together along the line joining their centers than there are keeping them apart. The closer they are, the greater the corpuscular pressure becomes. LeSage calculated the well known inverse-square law from this shielding effect. In his theory, gravity is not a pull – it is an external push. According to this view, a man's weight reflects the difference between how many corpuscles are hitting him from above, compared to how many are hitting him from below – and is a function of the earth's mass attenuating the upward-directed flux. (In fact, the mathematics of LeSagean mechanics is the mathematics of attenuation.) It is easy to see why the LeSagean theory is termed a physical theory of gravitation: its fundamental principle is simple enough for a child to grasp, without metaphysical mumbo-jumbo.

Advocacy for the theory declined after Lord Kelvin observed that the collisions between the hypothetical particles and normal matter would, over long periods of time, involve a heat transfer sufficient to melt planetary objects. (Subsequent physics showed how such particle collisions can be "elastic" and thus avoid any degradation of flux energy to heat – but by then, LeSage had been forgotten in the stampede to canonize Einstein.)

LeSagean gravitational theory is an important component in the dynamical thinking of most geocentrists, excepting those who prefer basing their position on general relativity. The theory has predictive power, for the equations of attenuation make it clear that the shape and orientation of an object determine the magnitude of force on it. In the LeSagean theory, a barbell held horizontally is heavier than one held vertically, and a feather will drop faster in a vacuum than a small ball of lead – predictions that directly oppose the dynamics of Newton, Galileo, and Einstein. Until the last decade, the predictions of LeSage would have been laughed off the stage, until instruments sensitive enough to detect such anomalies were pressed into service. When these anomalies were discovered, modern science rushed in to herald the discovery of some fifth fundamental force, termed (erroneously) supergravity by some excited researchers. But they had been beaten to the theoretical punch by more than two centuries by the gravitational theory championed by the geocentrists.

The peculiar behavior of pendulums just before and after an eclipse, and within deep mine shafts, has likewise been troubling to the standard gravitational theories, Einstein's included. Sax and Allen's pendulum measurements during the solar eclipse March 7, 1970 were startling, and subsequent measurements by Kuusela (Finland: July 22, 1990 and Mexico: July 11, 1991) still reflected anomalous, though less severe, deviations. (Cf. *Physical Review* D3, 823 and *General Relativity and Gravitation*, Vol. 24, No. 5, 1992, pg. 543-550). Mineshaft measurements of the gravitational constant evaded conventional analysis (Cf. Holding & Tuck, "A New Mine Determination of the Newtonian Gravitational Constant," *Nature*, Vol. 307, Feb. 1984, pgs. 714-716). These anomalies were predicted by the LeSagean theory, not by Newton, not by Einstein.

An ultrasensitive Cavendish torsion balance was pressed into service in the mid-1970's to determine experimentally how sound the inverse-square law of gravitation was (Long, "Experimental Examination of the Gravitational Inverse Square Law," Nature, April, 1976, Vol. 260, pgs. 417-418). The apparatus revealed systematic discrepancies of 0.37%. Considering how relativity theory makes much ado of infinitesimal anomalies it "predicts," this reported glitch is enormous – and is predicted by the LeSagean model promoted by modem geocentrists.

Here are several key experimental effects predicted and/or adequately explained only by geocentrists pursuing their theory of dynamics: one could legitimately turn the tables on Dr. Nieto and ask, "Where was modem physics? Its theories predicted something other than what was measured!"

Modern physics tends to respond with a yawn to such challenges, and Dr. Nieto's view that the theories that fit the data best are the ones worthy of acceptance is, in fact, naive. When comparisons between theories are made, the faithful will prove loyal to their theories, not the data. When confronted with evidence demonstrating the superiority of one theory over others (*e.g*., "A Comparison of Results of Various Theories for Four Fundamental Constants of Physics," *International Journal of Theoretical Physics*, Vol. 15, No. 4 (1976), pp. 265-270), the world of science merely shrugged, unmoved in its pre-existing biases. (In the example cited, the best theory, being anti-Einsteinian, gained no adherents for having met the experimental criteria better than did its cousins.) (This author, in phone conversation with a chief research scientist at the Laurence Livermore Labs in 1992, pointed out that the electron diffraction effect had been again recently derived using classical physics. Quantum mechanics was developed in part because classical physics could not account for this effect, but now that this was no longer true, the scientist dismissed the news with an annoyed "So what?" His precommitment to modern QCD theory colored his scientific worldview completely.)

The LeSage theory was developed mathematically, in painstakingly rigorous detail, and then underwent an important conceptual evolution in the mid-1980's. What if the ultramundane corpuscles were compressed to a greater density, so that more of them filled a smaller volume? In fact, what if they were squeezed shoulder to shoulder, so tightly packed that they could only jostle one another, but were no longer free to rocket through space like gas molecules do? Do the same rules of shadowing and attenuation apply now that the so-called LeSagean gas has become an ultradense mass? Would the pressure effects transmit in the same way as the original theory stipulated? Indeed, the same principles hold, except that acoustic pressure waves transmit the background gravitational pressure through this ultradense matrix.

This ultradense medium of geocentric physics is identified as the Biblical firmament. It has a density so great that a teaspoon of the firmament would weigh more than a trillion universes combined. (The computed density is termed the Planck density, 10^{94} g/cm^3.) Such assertions seem to earn Dr. Nieto's label of being merely "ad hoc." But a little research (in contrast to cavalier dismissal) would reveal that the constituent elements of this geocentric postulate can be found in the most highly respected scientific journals and publications. In fact, the literature has been of inestimable help in obliterating objections to the geocentric notion of a physical, ultradense firmament.

In *The Very Early Universe* (Gibbons, Hawking & Siklos, ©1983 Cambridge University Press), M.A. Markov defines a "particle" termed a "maximon," possessing the 10^{94} g/cm^3 density defined above, or more precisely, 3.6×10^{93} g/cm^3 (pgs. 359, 361). He writes, "If a black hole has internal Planck dimensions and an external mass equal to the Planck mass, the matter density in it is quantum (Pq). If it is not decaying, such a black hole represents some degenerate case: it can neither collapse. nor anticollapse if one assumes that the mass density cannot exceed pq. In other words, the requirement of a limiting density is very strong and leads to nontrivial consequences" (pgs. 366-367). Markov then explores the implications of a "liquid" made up of such maximons, and points out that from "a topological point of view the maximon liquid is a model of a quasi-isotropical space" (*ibid*). This citation is important, for geocentrists are often criticized for their description of "empty" space as a medium millions of times denser than lead, leading to the common objection that physical objects could never possibly move through so dense a medium. But the physics affirms the fact that such a medium can function as a space, through which other objects can freely pass. (A maximon is not necessarily a black hole, according to Markov, but "may be a particle of the same Planck dimensions, but with a structure essentially different from a black hole. Their gravitational radius coincides with their Compton length," *ibid*, pg. 365. This is pointed out here to cut short any critique that the firmament model clearly leans on general relativity by relying on the existence of microscopic black holes.)

Note Markov's use of the word, "nontrivial." This word is the most appropriate term one could apply to the firmament of the geocentrists – any object as stupendously massive as the firmament is asserted is to be taken very seriously, since it dwarfs the rest of the universe in comparison. It is ironic that geocentrists are routinely called upon to abandon this "quirky, inconsequential" notion, whereas secular science has continued to probe the idea theoretically and experimentally, while unaware of its ultimate implications.

In short, “empty” space is not a vacuum; it is not a “nothing,” it is a “something.” Correspondingly, it has properties and attributes that “nothingness” cannot possess. Dr. Robert J. Moon, Professor Emeritus in Physics at the University of Chicago, published an article in *21st Century*, May-June, 1988, pg. 26ff, entitled “Space Must Be Quantized,” addressing precisely this issue. He points out that “according to accepted theory, free space is a vacuum. If this is so, how can it exhibit impedance’? But it does. The answer, of course, is that there is no such thing as a vacuum, and what we call free space has a structure. ...[This impedance] equals 376+ ohms.” This reactive, energy-storing impedance is a natural corollary of geocentric theory and its ultradense firmament; it has not been accounted for by conventional science, and is not contained within either Newton’s dynamics or Einstein’s gravitational field equations. Where was conventional science in accounting for this effect?

The ultradense firmament of the geocentrists pops up in the literature in various guises, as theorists attempt to account for the experimental data flooding into the various centers of higher learning. Princeton’s John A. Wheeler is credited with being the first to describe what is now called “spacetime foam,” the notion that on ultramicroscopic scales empty space is filled with countless ultradense particles popping into existence and then becoming instantly extinct (1957). In 1968 he observed that “the central new concept is space resonating between one foam-like structure and another.” Noted astronomer Stephen Hawking developed the implications of this “foam,” which is distinctive in that on extremely small scales empty space is jam-packed with violently random activity and enormous mass (“virtual” mass in the modern terminology). (Cf. MW&T, *Gravitation*, pgs. 10, 11, 1180.) The physics at this scale, and the mathematics used to describe it, are daunting even to the cognoscenti. The geocentric firmament differs from the conventional understanding in affirming that the underlying particles are permanent and stable, whereas modern physics prefers to regard them as undergoing continuous and extremely rapid creation and annihilation, like an unstable foam. Both theories put the density of the particles at the Planck density.

In *Physical Review* D, Third Series, Volume 47, Number 6, March 15, 1993, pg. R2166ff, Redmount and Suen explore the question, “Is Quantum Spacetime Foam Unstable?” Utilizing fluctuating black holes and wormholes as constituents of the structure of space is a serious liability, the physicists conclude, because the inherent instability of these structures makes them unsuitable candidates as components of the underlying structure of space. There must be, in fact, “strong constraints on the nature” of the structure of space at scales down to the so-called Planck length (about 10-33 cm), the size of a maximon. This recent research points away from the Wheeler & Hawking models and toward the firmament of the geocentrists, which does not suffer from the stability problem associated with the hypothetical objects (wormholes, blackholes) populating the general relativity menagerie.

In the geocentric hypothesis, the firmament particles, although unable to “break ranks” because their neighbors are too close, are yet in rapid motion, colliding rapidly and continuously with their neighbors. (The fact that they possess rotational spin, something first proposed by Maxwell, will be taken up a little later in connection with electromagnetic theory.) Their behavior has a somewhat stochastic, or random, nature – as clearly taught as far back as LeSage in 1778. Their behavior is classical, but being as small as they are, they influence and induce other larger particles to behave in ways heretofore thought explicable only on quantum mechanical grounds. And, in point of fact, the tenets of the geocentrists’ firmament theory have emerged in connection with quantum mechanics, going as far back as Louis De Broglie’s work in the 1920’s.

An excellent discussion of this matter is set forth in J. P Vigier’s article, “De Broglie Waves on Dirac Aether: A Testable Experimental Assumption.” *Lettere Al Nuovo Cimento*, Vol. 29, No. 14, Dec. 6, 1980, pg. 467f. Vigier wrote, “Since Dirac’s pioneer work it has been known that Einstein’s relativity theory (and Michelson’s experiment) are perfectly compatible with an underlying relativistic stochastic aether model. Inherent to this model is Einstein’s idea that quantum statistics reflects a real subquantal physical vacuum alive with fluctuations and randomness. This concept of a nonempty vacuum has been recently revived not only to yield a foundation to the stochastic interpretation of quantum mechanics but also to explain causally possible nonlocal superluminal interactions resulting from the Einstein-Podolsky-Rosen paradox. Indeed, if a forthcoming experiment of Aspect confirms their existence, the only way out of the resulting contradiction between relativity and the quantum theory of measurement seems to lie in the direction of an extension of the causal stochastic interpretation of quantum mechanics. This assumes the existence of causal subquantal random fluctuations induced by a stochastic «hidden» thermostat proposed by BOHM, VIGIER and DE BROGLIE.” (pg. 467)

Although to the layman the last citation might appear impenetrably dense, the main points can be made clear. There are two schools of thought in the world of quantum mechanics, termed the Copenhagen Interpretation, and the Stochastic Interpretation (sometimes called the Causal Interpretation). The Copenhagen Interpretation is rather counterintuitive and mystical sounding to the layman. One example will suffice: flip a coin and cover it up immediately before looking at it. Is it heads or tails? The

Copenhagen Interpretation asserts that the coin is simultaneously heads AND tails while it is covered, but can be forced to fall back into either heads or tails once you take your hand off it and observe it. It then suddenly flips to a unique state by the mere act of observation.

The Stochastic Interpretation, unsatisfied with this somewhat bizarre worldview, asserts that the various unusual quantum effects measured on subatomic scales have an actual physical cause (hence, Causal Interpretation). If there is difficulty in simultaneously measuring the momentum and position of a subatomic particle (the Heisenberg Uncertainty Principle), it may be due to actual background noise: this is the point of view of the Stochastic Interpretation. This source of noise is the "nonempty vacuum" Vigier refers to, a level of physical reality discernible on ultra-small scales, and freighted with significance.

Vigier's prologue used the word "superluminal," meaning any entities or interactions that travel faster than the speed of light. He pointed out that if Aspect's then-upcoming experiment measured any superluminal interactions, the contradiction between general relativity and the stochastic theory would have to be decided in favor of the stochastic theory. Translation: if Aspect's experimental result is positive, the consequences would be hostile to general relativity and favorable to the firmament model, the one stochastic model that satisfies the stability constraints stipulated by Redmount and Suen in March, 1993.

Vigier reminds us "that Dirac aether rests on the idea that through any point 0 there passes a flow of stochastic particles and antiparticles" (pg. 468), reminiscent of the original LeSage theory. He then introduces spin to the stochastic particles making up what he calls a background sea of activity. He even prefers (pg. 470) that his stochastic particle undergo only short range motions: "contact particle-particle collision type interactions." This is the same restraint geocentrists place on their ultradense firmament model.

Vigier, working with Petroni, published an important article a year earlier than the last reference, in *Lettere Al Nuovo Cimento*, Vol. 26, No. 5, Sept. 29, 1979, pg. 149, entitled "Causal Superluminal Interpretation of the Einstein-Podolsky-Rosen Paradox," wherein he demonstrates that his stochastic model does not encounter the same pitfalls that the competing tachyon theory of Sudarshan, Feinberg, & Recami encounters in explaining faster-than-light interactions and objects. Says he, "We show in particular that superluminal, phase-like, phonon-like, collective motions of the quantum potential in Dirac's aether do net induce the well-known causal paradoxes of tachyon theory" At the conclusion of his exposition he points out. "It is interesting to note that this elimination of causal paradoxes is only possible in a subquantum model built on a Dirac's vacuum and cannot be applied to theories where superluminal signals are carried by tachyonic particles." He proposes allowing "superluminal signals to be acoustical waves with associated quantum potential..." in harmony with the better attested geocentric firmament model. (Geocentric astronomer Dr. Gerardus Bouw has performed some of the seminal computational work in this area of firmament dynamics in the early 1980's.)

The experiment by Aspect that J. P. Vigier was anticipating was performed, and the results published in *Physical Review Letters*, Vol. 47, No. 7, August 17, 1981, pgs. 460-463. Aspect, with partners Grangier and Roger, introduces his results with a little history: "Since the development of quantum mechanics, there have been repeated suggestions that its statistical features possibly might be described by an underlying deterministic substructure." The apparatus, which performed polarization correlation on photon pairs, involves hitting an atomic beam of calcium with a krypton ion laser and a second Rhodamine laser. The results confirm the existence of superluminal (faster-than-light) interactions, and served to further buttress the stochastic interpretation of quantum mechanics, which, as has been pointed out, has been evolving closer and closer to the geocentrist's firmament hypothesis. (The experiment was conducted again with greater precision, agreeing with the first experiment, and the new results published in *Physical Review Letters* Vol. 49, No. 2, July 12, 1982, again pointing to the geocentrist's firmament model by proving the existence of the quantum potential.)

The issue of superluminal phenomena is significant in light of the common theoretical challenge to geocentric cosmologies that they require every object past Saturn to travel faster than the speed of light in order to complete a daily revolution around the earth. Just as most of the preceding technical citations were provided and explained in the famous videotape that fell on closed eyes, so too are the following references.

In the February 1992 issue of the *American Journal of Physics*, W. M. Stuckey published an analysis titled, "Can galaxies exist within our particle horizon with Hubble recessional velocities greater than c?" (pgs. 142-146). Stuckey proposes to measure the speed at which galaxies are traveling away from us, utilizing their red shift. His test object, a quasar with a red shift of 4.73, is computed to be receding from us at 2.8 times the speed of light. So why is it a problem when geocentrists propose faster-than-light velocities for celestial bodies, and not a problem when mainstream scientists take such measurements in stride?

Stuckey explains that the quasar is fleeing from us so rapidly (at what would at first glance appear to be a completely impossible velocity) due to a property of the space between here and there. The vacuum between us and the quasar is stretching and expanding, and thus carries the quasar away from us faster than the speed of light. When modern scientists inform us that objects can travel faster than light due to the expansion of space, we marvel at their wisdom and learning. When geocentrists inform us that objects can travel faster than light due to the rotation of space, we marvel at their insanity. Yet, both models stipulate the same origin of the superlight speed, namely, the intrinsic properties of the space in which the objects are placed.

The idea of a rotating universe has been addressed in the secular literature on many occasions. Yu. N. Obukhov, in the recent study "Rotation in Cosmology" (*General Relativity and Gravitation*, Vol. 24, No. 2, 1992, pgs. 121-128), observes that "Since the first studies of Lanczos, Gamow and Gødel, a great number of rotating cosmological models have been considered in the literature. Nevertheless the full understanding of observational manifestations of cosmic rotation is still far from reach. Moreover, there is a general belief that rotation of the universe is always a source of many undesirable consequences. most serious of which are time-like closed curves, parallax effects, and anisotropy of the microwave background radiation. The aim of this paper is twofold – to show that the above phenomena are not inevitable (and in fact, are not caused by rotation), and to find true effects of cosmic rotation." Unfortunately, Obukhov refrains from putting the other foot down: "Here we shall not enter into a discussion of [the] philosophical significance of cosmic rotation (though, in our opinion, the analysis of its relation to the Mach's principle is of great interest)." Nonetheless, he follows the evidence to its conclusion: "As we can see, pure rotation can be, in principle, large, contrary to the widespread prejudice that large vorticity confronts many crucial observations."

Rotating universe models have continued to receive analytic scrutiny (cf. *Soviet Physics Journal*, March 1992, JETP 74 (3), "Accounting for Birch's Observed Anisotropy of the Universe: Cosmological Rotation?", by Panov and Sbytov; also *General Relativity and Gravitation*, Vol. 25, No. 2, 1993, pgs. 137-164, "Synchronized Frames for Godel's Universe," by Novell, Svaiter and Guimaraes). So the question remains: if outer space can stretch faster than the speed of light and carry objects with it, why can't it rotate faster than light and do the same? Sauce for the general relativity goose is sauce for the geocentric gander.

Dr. Nieto raises some observational challenges for geocentric cosmology, beginning with the parallax effect. There are two schools of thought among geocentrists as to how parallax arises (and ;f the quantum mechanicists can have two schools of thought, why not the geocentrists'?). The "pure" form of geocentricity centers the stars on the earth, and describes the resulting annual stellar shifts by placing the Earth at one sink of a conformal mapping. This procedure has been worked out in rigorous detail for the two-dimensional case by James Hanson, and agrees with the observed phenomena. (This paper regards this model as "pure" inasmuch as it conforms to the original cosmology of Tycho Brahe without modification.) The "modified Tychonic model" centers the stars on the Sun, so that the stars participate in the Sun's annual migration, with the observed parallax being directly predicted by the subsequent geometry. This second model would satisfy the requirements that any consistent relativist would impose on a legitimate geocentric frame of reference, and may well even have direct and indirect Biblical support.

In the geocentric model, the firmament is in daily rotation around the earth, and undergoes annual oscillations as well. This motion of the firmament is evidenced in the Sagnac effect, the well-known Coriolis forces, and by geosynchronous satellites (or, in a more Tychonian vein, geostationarv satellites). In the geocentric model, we agree that if the heavens ceased their rotation, the satellites would fall to the earth. But when the heavens are postulated to be in motion, it is Dr. Nieto's equations that are deficient, not ours.

There are four fascinating aspects of the geocentric model. (I) The notion of a structured firmament analogous to a crystal lattice permits one to consider elementary particles (electrons, protons, neutrons, etc.) to he phonons (quantized vibrations) within that crystal. (Cf. P. J. Bussey, "The Phonon as a Model for Elementary Particles," *Physics Letters* A 176, 1993, pgs. 159-164.) Bussey shows how phonons exhibit all the experimentally measured properties of elementary particles, including particle splitting and wave collapse. The appeal of the theory is in its predictive power and correlation with reality. Its difficulty is that an appropriate medium must exist in which these vibrations are to propagate, namely, a medium having the properties of the geocentrist's firmament. Because the geocentric firmament's fundamental ultramassive particles are packed as tight as atoms within a crystal, it serves as the ideal lattice structure for a phonon-based theory of particle structure to succeed.

The notion of space being some kind of crystal (in harmony with the geocentric and Biblical views of the firmament) is a topic of serious discussion in modern physics. Holland and Philippidis have explored the idea in their article, "Anholonomic Deformations in the Ether: A Significance for the Electrodynamic Potentials," (Hiley & Peat, eds., Quantum Implications, ©1987 Routledge, pgs. 295ff). They write, "In attempting to discover the classical significance of the At, [electromagnetic potential - MGS] we have at our disposal several clues. Bohm has suggested an analogy between the Aharonov-Bohm effect and the dislocation of a crystal lattice... Dirac showed how an ether which at each point has a distribution of velocities which are all equally probable would be consistent with relativity, and alternative approaches to the quantum theory by Bohm and Vigier have indicated that a suitably fluctuating ether can contribute to an understanding of the micro-domain. We recall that much effort was expended in the nineteenth century in trying to understand electromagnetic processes in terms of stresses set up in an ether treated as an elastic solid."

Philippidis, Dewdney and Hiley pointed out that "as far as the quantum domain is concerned, space cannot be thought of simply as a neutral back cloth. It appears to be structured in a way that exerts constraints on whatever processes are embedded in it. More surprisingly still, this structure arises out of the very objects on which it acts and the minutest change in any of the properties of the contributing objects may result in dramatic changes in the quantum potential... It is clear, therefore, that the quantum potential is unlike any other field employed in physics. Its globalness and homogeneity in the sense of not being separable into well-defined source and field points indicate that it calls for a different conceptual framework for its assimilation." ("Quantum Interference and the Quantum Potential," II Nuovo Cimento, Vol. 52B, No. 1, July 11, 1979).

The firmament of the geocentrists is explored under the name of the quantum potential by some, and by different names by other researchers. G. Gaeta, writing in *Physics Letters* A 175 (1993), pgs. 267-268, wrote of an "unknown medium originating" the observed quantum Brownian noise. Says he, "If we accept this picture, the particles of the EPR experiment are in permanent contact with a NGV stochastic process." This functional synonym for the geocentrist's firmament is named after the scientists whose constraints color its characterization, Nelson, Garbaczewski and Vigier. Gaeta treats this medium as completely universal: "The universality of quantum mechanics corresponds to the universality of the NGV process: this means that no physical system or particle can be regarded as truly isolated, as every physical system or particle - being subject to quantum mechanics – is at least in contact with the universal NGV process."

The concluding paragraph in the article, "Causal Particle Trajectories and the Interpretation of Quantum Mechanics" (*Quantum Implications*, pgs. 169-201) exposes the dilemma for modern physics in telling language: "The interpretation of Bohr and of de Broglie-Bohm-Vigier both emphasize that the fundamentally new feature exhibited by quantum phenomena is a kind of wholeness completely foreign to the post-Aristotelian reductionist mechanism in which all of nature in the final analysis consists simply of separate and independently existing parts whose motions, determined by a few fundamental forces of interaction, are sufficient to account for all phenomena. The difference arises in the methods for dealing with the situation. One thing however is clear; the organization of nature at the fundamental level is far more complex than mere mechanistic models can encompass. The ghost cannot be exorcised from the machine."

(2) The firmament itself provides for a complete gravitational theory based on the physics of shadowing and attenuation, yielding predictive results beyond those of conventional theory. By introducing the element of spin, and thus angular momentum, to the firmament subparticles, the antisymmetric properties of electromagnetic fields obtain, being construed as a transfer of angular momentum particle by particle and giving rise to the well known perpendicularity of the electric and magnetic fields. In Dr. Bouw's model, the firmament even accounts for the strong nuclear force that holds protons and neutrons together in atomic nuclei: as two nucleons make actual contact, the shadowing effect goes asymptotic according to the known attenuation expression, and the total force is all inward, its magnitude characterized by the Yukawa potential. This model therefore is a nascent unified field theory, or what is now termed a GUT (Grand Unification Theory), that accounts for all available physical effects that can be measured by science, from gravitation, electromagnetism, strong nuclear force, the Uncertainty Principle, elementary particle structure, etc. In other words, the early work of developing a new dynamics is well underway, as propounded at the outset.

The third and fourth developments are recent, homespun insights not heretofore published, and therefore not yet subjected to peer review. Although potentially premature, the benefit from airing them outweighs the risk; I invite the reader to weigh the following notions carefully.

(3) It is often objected that if geocentricity were true, and the rotating heavens were dragging Foucault pendula and weather systems around, why doesn't that force pull on the earth itself and drag it along, causing it to eventually rotate in sync with the heavens? It appears that this straightforward application of torque to the earth should cause it to rotate in turn, but this turns out to be an oversimplification. As the heavens rotate, and the firmament rotates on an axis through the earth's poles, each firmamental particle (the ones comprising the ultradense lattice) also rotates with the same angular velocity. Ironically, this is precisely the reason the earth can't be moved. In MT&W's Gravitation, pg. 1119-1120, we are invited to ponder the following scenario:

> "Consider a rotating, solid sphere immersed in a viscous fluid. As it rotates, the sphere will drag the fluid along with it. At various points in the fluid, set down little rods, and watch how the fluid rotates as it flows past. Near the poles the fluid will clearly rotate the rods in the same direction as the sphere rotates. But near the equator, because the fluid is dragged more rapidly at small radii than at large, the end of a rod closest to the sphere is dragged by the fluid more rapidly than the far end of the rod. Consequently, the rod rotates in the direction opposite to the rotation of the sphere. This analogy can be made mathematically rigorous."

Now reverse the situation. If we want to cause the sphere to rotate clockwise, we would need to turn the rods at the poles clockwise, and the ones at the equators counterclockwise. (Consider the equator as a big gear, and the firmamental particles as small gears that engage it. It is intuitively obvious that the small gears must always turn in contrary motion to the large one at the equator.) This picture is clear then: to turn the sphere, the rotation of the particles (MT&W's "rods" and this author's "gears") at the poles must be the opposite of that at the equator.

However, in the case of a rotating firmament, all the particles are rotating in the same direction, with the angular velocity common to the entire firmament. The equatorial inertial drag is in the opposite direction as that acting near the poles. Using calculus, one integrates the effect from the center of the Earth outward in infinitesimal shells, showing that the Earth is in fact locked in place, the resulting inertial shear being distributed throughout the Earth's internal volume. It could be demonstrated that were the Earth to be pushed out of its "station keeping" position, the uneven force distribution would return it to its equilibrium state. Intriguingly, the significance of these internal forces on seismic stress, plate tectonics, and the earth's magnetic field may prove central, if so be that these postulates survive the inevitable peer review to come.

(4) Consider again Grön & Eriksen's position that a rotating cosmic mass imposes an upward force on a geostationary satellite. (They used the Earth as a synchronous satellite for the Moon in their article to illustrate the principle.) They posit that the centrifugal force on the satellite arises from a cosmic non-tidal gravitational field pulling up on the satellite. Consider, then, the behavior of light traveling to the Earth from distant celestial objects: would it not also be subject to the effects of this cosmic nontidal inertial pull? Logic would dictate that, yes, in accordance with the late Dr. Richard Feynman's *Lectures in Physics*, Vol. 2, pgs. 42-10 & 42-11, as well as the extended discussion in MT&W's *Gravitation*, pgs. 1055-

1060, incoming light subject to the induced gravitational field will lose energy and thus decrease in frequency, according to the known relations that govern calculation of gravitational red shifts.

If true, then the rotation of the cosmic mass could be responsible for the red shift heretofore understood as a Doppler consequence of the Big Bang. This in turn would provide a new basis for measuring the distance of celestial objects, one wholly different than the system erected upon the Doppler view of the red shift, which could involve a significant remapping of the heavens.

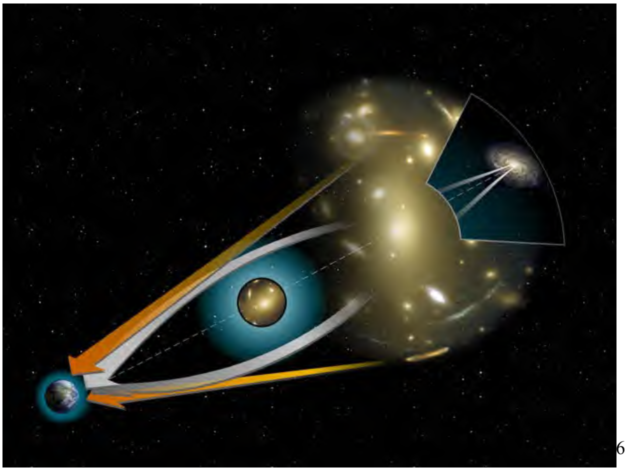
But more intriguingly, this result, if confirmed, would be hostile to general relativity, because the theory would require the red shift to be observed whether it is the Earth or the heavens that are rotating, whereas on classical grounds it would only be expected if the heavens were rotating, and the result would be the same whether measured from the Earth, from a satellite, or from the space shuttle. At this point in time, the experimental evidence militates against relativity on this effect, so that relativity would either need to neutralize the red shift predicted under a rotating cosmos scenario, or abandon its core postulate.

It would then appear that geocentrists are more than willing to risk making scientific predictions to put their hypotheses to the test. Some have already passed muster, but others are too recent to have gone through the requisite shaking-out period. This is to be expected in the infancy of the development of a new dynamical theory that embraces every aspect of reality, from unthinkably massive and immense objects to the world of the ultramicroscopic reality underlying the atomic realm.

Appendix 2

Gravitational Lensing: Real or Imagined?

Among other things, gravitational lensing is proposed by modern cosmology as evidence for the existence of Dark Matter.



[663]

One source states:

> A gravitational lens is formed when the light from a very distant, bright source (such as a quasar) is "bent" around a massive object (such as a cluster of galaxies) between the source object and the observer. The process is known as gravitational lensing. Dark matter affects galaxy clusters as well. X-ray measurements of hot intracluster gas correspond closely to Zwicky's observations of mass-to-light ratios for large clusters of nearly 10 to 1. Many of the experiments of the Chandra X-ray Observatory use this technique to independently determine the mass of clusters. The galaxy cluster Abell 2029 is composed of thousands of galaxies enveloped in a cloud of hot gas, and an amount of dark matter equivalent to more than 1014 Suns. At the center of this cluster is an enormous, elliptically shaped galaxy that is thought to have been formed from the mergers of many

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[663] Caption from Wikipedia states: "Bending light around a massive object from a distant source. The orange arrows show the apparent position of the background source. The white arrows show the path of the light from the true position of the source."

smaller galaxies. The measured orbital velocities of galaxies within galactic clusters have been found to be consistent with dark matter observations. Another important tool for future dark matter observations is gravitational lensing. Lensing relies on the effects of general relativity to predict masses without relying on dynamics, and so is a completely independent means of measuring the dark matter.[664]

A more general summation of gravitational lensing states:

A gravitational lens refers to a distribution of matter (such as a cluster of galaxies) between a distant source (a background galaxy) and an observer, that is capable of bending (lensing) the light from the source, as it travels towards the observer. This effect is known as gravitational lensing and is one of the predictions of Albert Einstein's General Theory of Relativity. Although Orest Chwolson is credited as being the first to discuss the effect in print in 1924, the effect is more commonly associated with Einstein, who published a more famous article on the subject in 1936. Fritz Zwicky posited in 1937 that the effect could allow galaxy clusters to act as gravitational lenses. It was not until 1979 that this effect was confirmed by observation of the so-called "Twin QSO" SBS 0957+561. Spacetime around a massive object (such as a galaxy cluster or a black hole) is curved, and as a result light rays from a background source (such as a galaxy) propagating through spacetime are bent. The lensing effect can magnify and distort the image of the background source. Unlike an optical lens, maximum 'bending' occurs closest to, and minimum 'bending' furthest from, the center of a gravitational lens. Consequently, a gravitational lens has no single focal point, but a focal line instead. If the (light) source, the massive lensing object, and the observer lie in a straight line, the original light source will appear as a ring around the massive lensing object. If there is any misalignment the observer will see an arc segment instead. This phenomenon was first mentioned in 1924 by the St. Petersburg physicist Orest Chwolson,] and quantified by Albert Einstein in 1936. It is usually referred to in the literature as an Einstein ring, since Chwolson did not concern himself with the flux or radius of the ring image. More

---

[664] http://en.wikipedia.org/wiki/Dark_matter

> commonly, where the lensing mass is complex (such as galaxy groups and clusters) and does not cause a spherical distortion of space–time, the source will resemble partial arcs scattered around the lens. The observer may then see multiple distorted images of the same source; the number and shape of these depending upon the relative positions of the source, lens, and observer, and the shape of the gravitational well of the lensing object.[665]

Problems with the gravitational lens thesis begin at the foundation of modern cosmology.[666] Besides the fact that it is built on an unproven premise that redshift indicates distance (a fact that even Hubble admitted in the early stages of his observational findings (and which has been confirmed by Halton Arp's discoveries that high redshift quasars are connected to and thus are the same distance from us as low redshift galaxies and therefore the latter cannot serve as "gravitational lenses" for the former), the whole idea that light is bent by gravity in the manner dictated by the General Theory of Relativity is unproven as well.[667] Hence, when gravitational lensing is based on "Twin QSO SBS 0957+561," which is said to have a redshift of 1.41 and is thus 8.7 billion light years from Earth, whereas the galaxy that is said to be its gravitational lense has a red shift of 0.355 and is 3.7 billion light years from Earth, we must take these statements with a grain of salt.

We must also ask the basic question about gravitational lensing itself. The theory states that because there is a light source behind every galaxy, then that light source should be bent before it reaches our telescopes on Earth. Since every observable galaxy has behind it a source of light, this necessarily means that we should see light being bent around every galaxy in the observable universe. This would result in the sky being filled with duplicate images of these distant light sources and present us with an even more dire version of Olber's paradox. In the end, the gravitational lensing theory suffers from an acute selection bias. Despite these anomalies, we will examine the claims granting for the sake of argument that the foundations are correct.

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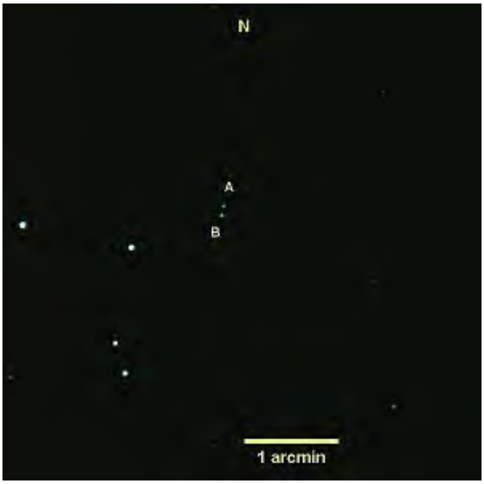
[665] http://en.wikipedia.org/wiki/Gravitational_lens.

[666] Our thanks to Miles Mathis for his critique of gravitational lensing, much of which we include in our appendix. In his conclusion, Mr. Mathis states: "Prima facie, the hypothesis is weak, and the more one studies the examples, the weaker it gets. The theory is never defended in a cogent manner, it is simply asserted, and all anomalies are ignored. The Twin Quasar and Einstein's Cross are not strong examples, but every page on gravitational lensing leads with them. This is itself a tip-off, for if stronger examples existed we would not need to hear of the weak examples….This is how the standard model operates, on all questions. There is no possible defense of its nebulous hypotheses, so its only hope it to reject announcements and papers, to browbeat anyone who sits still for a moment, and to pre-empt discussion by a constant professional patter of propaganda" (milesmathis.com/lens.html).

[667] See Edward H. Dowdye, Jr. "The Shapiro Delay: A Frequency Dependent Transit-Time Effect," Proceedings of the National Philosophy Alliance, July 2011, http://www.worldnpa.org/site/abstract/?abstractid=6105&subpage=pdf.

The Wikipedia source for the Twin Quasar states: "The lensing galaxy with apparent dimension of 0.42 × 0.22 arcminutes lies almost in line with the B image, lying 1 arcsecond off," and is identified as "YGKOW G1 (sometimes called G1 or Q0957+561 G1), is a giant elliptical (type cD) lying within a cluster of galaxies that also contribute to the lensing." As such, the first question is how the lensing galaxy could shift the B image by one arcsecond. The center of mass for the galaxy would need to be off-center by a significant amount, especially since YGKOW G1 is an elliptical galaxy which are known to be very smooth, much more than spiral galaxies in which mass congregates in the arms. Some have noted this problem and answer it by positing that globular clusters help in the lensing. But this solution, of course, only admits to the problem but does not possess proof of its answer since no globular clusters have been found.

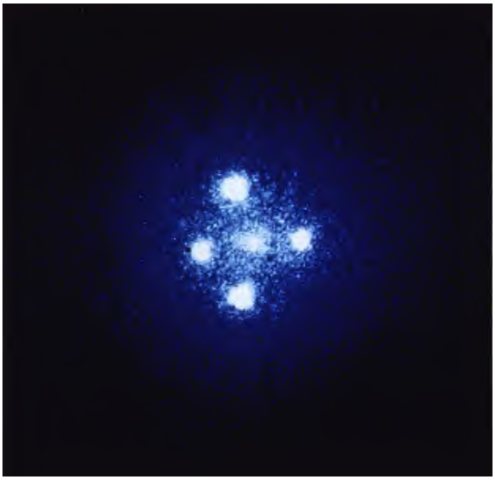
Twin Quasar 0957 + 561



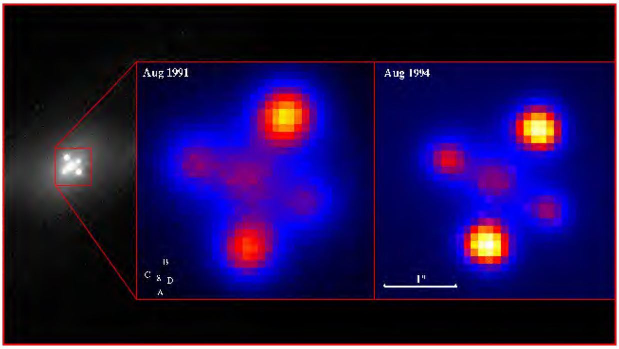
Additionally, an elliptical galaxy would not likely produce a double image (as in the above photography) but a more diffuse circular images since the quasar light is emitted in spherical dimensions. That an elliptical galaxy could magnify the quasar light so precisely as to project two distinct images on Earth is quite an unlikely scenario, especially since the quasar is said to be five billion light years from the lensing galaxy. Since the galaxy is said to be 3.7 billion light years from Earth, this would translate the 1 arcsecond angle of bending to about 18,000 light years, which means that the quasar light is passing by the lensing galaxy at a distance of 18,000 light years. That's quite a stretch, since we know that even star light that passes near the sun is bent only near the surface of the sun.

There is also a problem with how images A and B of the Twin Quasar are situated with the lensing galaxy. A and B are about 6 arcseconds apart and the lensing galaxy is about 1 or 2 arcseconds in width between A and B, which leaves about 3 or 4 arcseconds that image A or B lies from the edge of the lensing galaxy. Since for every arcsecond there is 18,000 light years of distance, then 3 arcseconds would be 54,000 light years and 4 arcsecond would be 72,000 light years that either A or B is from the edge of the galaxy. Bending of light simply cannot occur that far out unless, of course, one abandons both Newtonian and Einsteinian gravity theory.

Einstein's Cross



The same Wikipedia article offers “Einstein’s Cross” as another example of gravitational lensing. The caption underneath the picture says: “In the formation known as Einstein's Cross, four images of the same distant quasar appear around a foreground galaxy due to strong gravitational lensing.” Similar to the images of the “Twin Quasar,” the four images of Einstein’s Cross are off center. This means that the lensing galaxy is not in the center of the composite image. In fact, the lensing galaxy’s center of mass would need to be quite a distance to the left of the galaxy in order to produce the left-weighted position of the upper and lower images. Additionally, in order to produce four distinct images surrounding the center image, the lensing galaxy would at least need to be spherical and at best cubical, but even then we would expect to see some kind of arcing, not to mention at least some images produced in the four corners, giving eight images in all. Rather, we see four distinct images in the vertical and horizontal positions but nothing in the corners except small points of light. The four images themselves are circular and undiffused, thus showing that they are not under the influence of a curved gravitational field at all. An attempted explanation of this anomaly was given at physicsforums.com:



> A: Tell me if I’ve got this right....The light from a distant quasar is bent around a more nearby galaxy, which is acting like a lens producing multible images of the quasar... correct? What’s up with this ? Is the lensing galaxy rectangular? Why is the “lensing effect” producing four distinct images and not some distorted circular patterns?

> B: It's not rectangular, the lining is just that good, it is an oddity, but one that sheds alot of light, no pun intended, on gravitational lensing.
>
> A: The lining could be perfect and the lensing effect still shouldn't look like that....If the lensing object is spherical it should bend the light from an object behind it equaly in every direction, which will create a "circle of light" around the lensing object, not four distinct copies in a crossformation. Am I mistaken?
>
> B: You took my meaning of lining wrong, its not a straight line, the quasar in the back is off alittle bit, which creates the four points. Actually the light is bent spherecly, [sic] but due to the alignment, it peaks at four points, and the other stuff gets lost in space. That is it is so small it doesn't show up, and if you increase the exposure time, the galaxy in front will saturate the image.
>
> A: Ok, I see... thnx![668]

Mathis comments:

> For some reason our forum member is satisfied with that terrible answer: members who argue with the experts are routinely shunned and then banned, so it is best not to make much noise. But let us look at the answer here. The light is bent spherically, but peaks at four points: that is not an explanation, that is a statement. "We see four points, therefore the image peaks at four points." Zero content. Even if the image did peak at four points, for some physical reason not mentioned here, the image would not be expected to "unpeak" right at the top and bottom edge of the images we see. We don't see "peaks," we see spikes surrounded by zero amplitudes. In fact, a quasar "off a bit" from center would not create peaks, much less spikes. It would create a bent image on one side only, or at the most two sides. It could not create four images, since it would have to create unequal bending in order to do so. To make this even sillier, our expert says, "the other stuff gets lost in space." The light in the four

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[668] http://www.physicsforums.com/showthread.php?t=1375

> corners is so dim, it gets soaked up by the vacuum, I guess, by some mechanism of light destruction so fundamental it doesn't have to be mentioned. Equally silly is the idea that "the galaxy in front will saturate the image." The galaxy in front is not as bright as the quasars, but if we give it time, it will become brighter than them and fill up all the dark spots, relieving us of our need to look at them and ask questions about them.

Further anomalies of Einstein's Cross for the gravitational lensing theory were noted by others. One site states:

> Is the Einstein Cross a gravitational lens (a galaxy-sized fun-house mirror), or is it a redshift anomaly, proving that the "redshift-equals-distance" assumption is fatally flawed?
>
> In the mid-1980's, astronomers discovered these four quasars, with redshifts about z = 1.7, buried deep in the heart of a galaxy with a low redshift of z = .04. (The central spot in this image is not the whole galaxy, but only the brightest part of the galaxy's nucleus.) This could have been seen as a crucial verification of Halton Arp's discordant redshift associations. It could have been proof that the redshift-equals-distance relationship is fatally flawed. Instead, Einstein's space-warping principle was invoked, and astronomers announced they had discovered a single distant quasar split into four images by the gravity of the foreground galaxy. A galaxy-sized fun-house mirror!
>
> But how well does the image fit the theory? Einstein predicted that light from a distant object that was gravitationally warped around a massive foreground object would form arcs or even a full circle. Here we see four bright spots and no ring-like elongations. In fact, all four of the bright spots are elongated in the wrong direction: they stretch toward the galaxy center.
>
> More observations were undertaken. Using the Hubble Space Telescope, a friend of Arp's documented that quasar D (right side of photo) is physically connected to the nucleus of the galaxy. Later, a high redshift connection was discovered between quasars A (bottom) and B (top) which passes in front of the connection between the nucleus and quasar D. But these

> observations went unnoticed: the journal which usually prints results from the Hubble Space Telescope rejected this announcement twice.
>
> Mathematical analysis, too, casts doubt on the gravitational lens theory. The faint foreground galaxy would need to be much bigger and brighter in order to accomplish this lensing feat: In fact, it would have to be 2 magnitudes brighter than "conventional quasars," the brightest objects known.
>
> These two photos show brightness changes observed over a period of three years. The lensing explanation is that the warping of the light varies when individual stars pass in front of the quasar. Arp's explanation is that the galaxy has ejected four quasars, which are growing brighter and moving farther from the nucleus as they age.[669]

Mathis concludes:

> Both rings and distinct images can be explained by refraction, since matter can be cast off either in jets or in haloes. Haloes will give us arcs of refraction and jets will give us a distinct area of refraction. But lensing cannot explain the lack of arcing we see in Einstein's cross, since galaxies cannot create square lenses.
>
> So you can immediately see that we don't need an esoteric explanation of bending, when we already have a prosaic explanation. Even before I showed the logical inconsistencies of the theory of lensing, it was much more likely and plausible that rings and arcs and multiple images were caused by refraction than by gravitational bending. Astronomers assigned the phenomena to gravity only because they were already in search of such "proofs." They needed the bending to be caused by gravity, so they ignored the more likely explanations. As in so many other instances, they let the theory determine the data. Instead of having data, and then developing a theory to contain it, they had a theory, and then went in search of data to support it. The science of the hysteron proteron.

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[669] "The Einstein Cross," Jul 26, 2004, http://www.thunderbolts.info/tpod/2004/arch/040726nebula.htm

> But now we can see that logic supports refraction, and refutes lensing. This is because refraction can explain the very limited instances of bending we do get. Refraction requires that we have an area of refracting medium, of the right refraction index, at the right distance, and at the right angle, in order to send an image to us. This would be expected to be a fairly rare occurrence, even at universal scales.[670]

Edward Dowdye, former NASA engineer, adds these observations to the issue:

> The evidence is all over the celestial sky and the background images of all those lensing galaxies have absolutely nothing at all to do with Gravitational lensing of General Relativity. The modern high resolution telescopy has light amplification powers and is able to view very weak signals and faint images (of few photons per count) making visible what was not visible 50 years ago because the technology was not there yet. What is seen in most cases is the scattering of the light coming from the far background regions or galaxies emitting light to regions of space where there in little or no light at all (complete blackness). The scattered light from the background sources are responsible for the false alarms or the false images. These images are incorrectly interpreted as having something to do with gravitational lensing or light bending effects of General Relativity. All you have to do is change the wavelength or frequency of the observed waves or the images, and then the images will look entirely different. All the features will totally disappear and the feature will no longer be visible in the infrared and the ultraviolet. This is something the mainstream does not want to talk about…these images do not have there counterparts in other regions of the spectrum, namely, the infrared and the ultraviolet. If lensing or light bending of General Relativity is correct then it should work in the infrared as well as in the ultraviolet. The GR effect is supposed to be totally independent of the frequency.[671]

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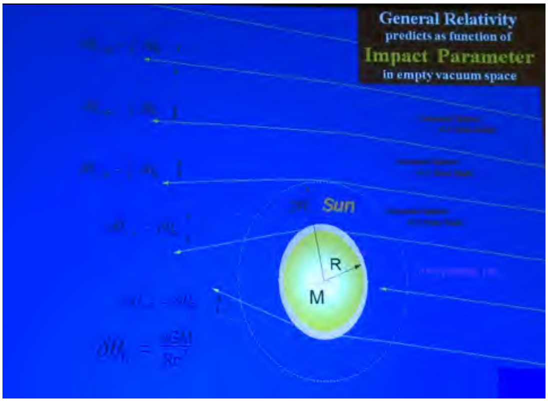
[670] www.milesmathis.com/lens.html

[671] Private email of July 2, 2012. See Dr. Dowdye's Lecture at http://alhadathnews.com/tube/the-failed-attempts-to-detect-macro-lensing-edward-dowdye-jr-md19m9mHx8GmyN0.html

In a paper for the *American Physical Society*, Dowdye states in his abstract:

> Significant findings show that one of the most misunderstood of all observed astrophysical phenomena is that of gravitational lensing. The Mathematical Physics of Gauss' law of gravity, the analogy of the Gauss' law of charges is directly applicable to the gravitational light bending at the sun. Astrophysical observations are consistent with an indirect interaction involving a plasma medium, not a direct interaction in the empty vacuum space above the rim. A century of observations reveal that gravitational light bending effects have been noted to occur predominantly at the thin plasma rim of the sun, not in the vacuum space a fraction of a solar radius above the rim. Light bending as predicted by General Relativity should be an easily detectable at analytical Gaussian spherical surfaces of various radii; at 2R, 3R, 4R and 5R respectively, where R is the radius of the sun. The observational evidence is clearly inconsistent with the light bending rule of General Relativity since this vacuum space and the solar plasma rim are exposed to virtually the same field.[672]



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[672] "No Gravitational Lensing in Vacuum Space a fraction of a Solar Radius above Solar Rim," *Bulletin of the American Physical Society*, 42nd Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics, Volume 56, Number 5, June 13–17, 2011 (http://meetings.aps.org/Meeting/DAMOP11/ Event/147260); http://www.24-7pressrelease.com/view_press_release.php?rID= 185702; See also "Gravitational Lensing in Empty Vacuum Space Does Not Take Place," *Proceedings of the NPA*, College Park, MD, 2011.

Appendix 3

By Dr. Robert Bennett

Einstein's train derailed; the light clock smashed

ALFA theory has been tested successfully against many classic motion problems in physics – from Newton's Bucket to Ruyong Wang's FOC. Here we pick up the story by applying ALFA to the train gedanken experiment and then the light clock device of relativity, with the same results as before. A practical implementation of the light clock is suggested to validate claims made herein. The analysis again supports a mobile aether that can be dragged along by ambient matter motion and a laboratory frame anywhere on the ground that can – and must – serve as an absolute frame, if the physics laws of motion are to be covariant. It's strange that the effect of a wind vector on sound speed is well known to be $Vsound\ + - Vwind$; yet the same effects – like Doppler shifts and time delays – are seen when $Vlight\ +\_Vaether\ = c\ + - Vaether\dots$ and ignored or rejected.

The Einstein train

Relativity model -We set the scene by referral to a Wiki article[673] on the train model used to explain relativity…..

... a thought experiment consisting of one observer midway inside a speeding train car and another observer standing on a platform as the train moves past. It is similar to thought experiments suggested by .... Einstein in 1917[674].

A flash of light is given off at the center of the traincar just as the two observers pass each other. The observer onboard the train sees the front and back of the traincar at fixed distances from the source of light and as such, according to this observer, the light will reach the front and back of the traincar at the same time.

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[673] http://en.wikipedia.org/wiki/Relativity_of_simultaneity

[674] Einstein's thought experiment used two light rays starting at both ends of the platform. See: Einstein A. (1917), *Relativity: The Special and General Theory*, Springer; Einstein, Albert (2009), *Relativity - The Special and General Theory*, READ BOOKS, pp. 30–33, ISBN 1-4446-3762-2, Chapter IX.

The observer standing on the platform, on the other hand, sees the rear of the traincar moving (catching up) toward the point at which the flash was given off and the front of the traincar moving away from it. As the speed of light is finite and the same in all directions for all observers, the light headed for the back of the train will have less distance to cover than the light headed for the front. Thus, the flashes of light will strike the ends of the train car at different times.

SR model

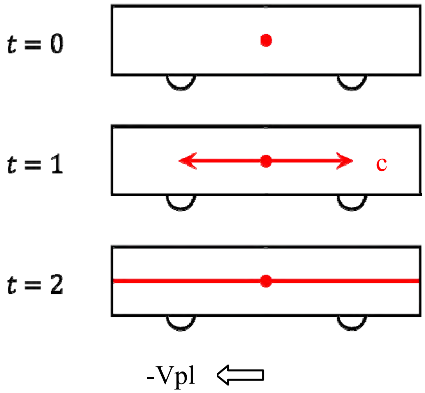

Fig. 1 Train view[675]

Fig. 1 is the train view of the light beams: 2D is the car length measured on the train and on the platform when the train is stopped there, c is the light speed along the red optical paths, by SR axiom 2.

$$-Vpl\,(=\ +Vtr\,) \tag{1}$$

is the platform speed seen in the train frame, by SR axiom 1. There is no dragged aether; aether does not exist.

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[675] http://upload.wikimedia.org/wikipedia/commons/c/ce/Traincar_Relativity1.svg

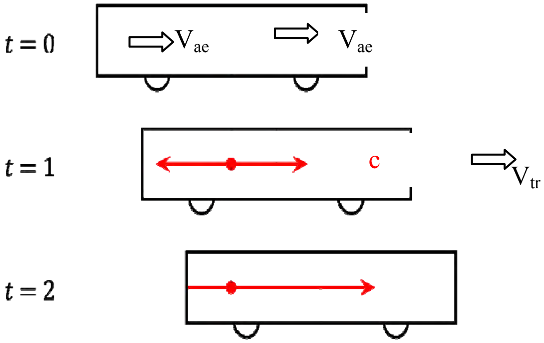

Fig. 2 Platform view[676]

Fig. 2 is the platform view of the light beams; Vtr is the train speed in the Pl frame.

Summary of SR analysis: As explained above, the platform observer sees the simultaneous arrival of the 2 beams, but onboard the light arrives at the back of the train first.

In Fig. 3.

$$Vae > 0, \tag{2}$$

as supported by 6 anisotropy experiments listed by Cahill. Vae is the dragged aether speed, which trails behind the leading edge of the car, and is independent of whether the car is open or sealed.

…indicates the train location when the light beams hit the car.

In the Pl frame:

Df is the distance traveled by the forward light beam; Dr is the distance traveled by the rear light beam when the walls are reached. Vae is the aether dragged by the train….

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[676] http://upload.wikimedia.org/wikipedia/commons/7/72/Traincar_Relativity2.svg

$$Vae = Vtr \tag{3}$$

ALFA uses a special restricted Galilean transform, with absolute time and the absolute reference frame… the lab frame. This may be termed Galilean Absolutism …. The GalAbs transform set.

A 1-Dimenional GalAbs:

$$X'(T') = Xobj,ae(T) + Xae,lab(T) \tag{4}$$

$$T' = T = Tlab \tag{5}$$

It follows that

$$V'(T') = V'(T) = Vobj,ae(T) + Vae,lab(T) \tag{6}$$

When applied to light, where the object is light/photon, then

$$SoL = c + - v\ , \tag{7}$$

as shown in the ALFA paper.

For this application:

$$tc = tf = tr = t \tag{8}$$

… time is the same in all frames

Absolute time means one time for all. The times for the light beams to hit the walls in the train frame(t_{tr}) and on the platform for the forward(t_f) and rear(t_r) beams are equal for GalAbs.

In the Tr frame:

$$c = D/t \ => \ D = ct \tag{9}$$

On the platform, for the forward beam:

$$Vf = Vph,ae + Vae,pl = +c + Vae \tag{10}$$

(ph = photon)

So

$$Df = (c + Vtr)t = (v + Vtr)D/c \ = (1 + \ Vtr/c)D\ , \qquad (11)$$

from

$$D = ct \qquad (12)$$

in the Tr frame.

Df is always $>\ D$ when the train is moving…
E.g., for

$$c \ = \ 2Vtr\ , Df \ = \ 1.5\ D \qquad (13)$$

On the platform, for the rear beam:

$$Vr \ = \ Vph, ae \ + \ Vae, pl \ \ = -c \ + Vae \qquad (14)$$

So

$$Dr \ = \ (-c \ + \ Vtr)t \ \ = \ (Vtr/c \ - \ 1)D \qquad (15)$$

E.g., for

$$c \ = \ 2Vtr\ , Dr \ = \ -0.5\ D \qquad (16)$$

In the train frame, light speed

$$Vph, tr \ = \ +- \ c. \qquad (17)$$

The aether co-moves with the train, so

$$Vae, tr \ = \ 0 \qquad (18)$$

In the platform/lab frame

$$Vph, lab \ = \ +- \ c \ + \ Vae \ \ = \ +- \ c \ + \ Vtr \qquad (19)$$

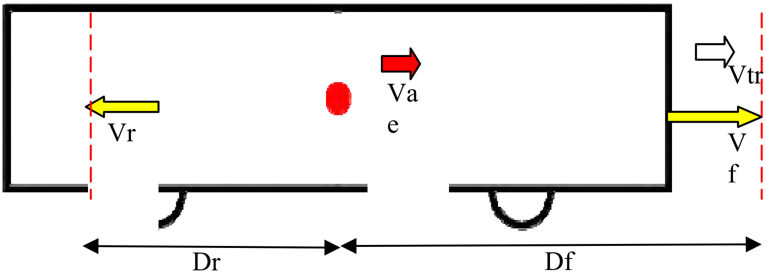
Vr
Va
e
Vtr
V
f
Dr
Df

Figure 3: ALFA Model

Relativity predicts that the platform speed measured on the train will be equal and opposite to the train speed seen on the platform….

$$Vpl,tr \; = \; -Vtr,pl \tag{20}$$

This is false …. The platform/lab speed contains the aether speed,

$$Vae,lab \; = \; Vtr. \tag{21}$$

Another way to look at the lab's absolutism is: The laws of physics – the Galilean law of velocity addition – is obeyed in the lab, since

$$Vtotal \; = \; V1 \; + \; V2 \; = \; +- \; v \; + \; Vae. \tag{22}$$

The law of velocity addition is NOT obeyed on the train, since

$$Vtotal \; = \; V1 \; + \; V2 \; = \; -+ \; v \tag{23}$$

And

$$Vtr \; (= \; Vae) \tag{24}$$

is measured, when relativity theory predicts

$$Vtr \; = 0 \tag{25}$$

in the train frame.

The laws of physics are TRUE in the lab frame. The laws of physics are NOT TRUE in the train frame, so any frames moving relative to Earth are not covariant.

There is no time dilation, clock bias, or other tampering with common sense. The distance increases when the light beam moves forward and shrinks when in reverse. So there is length expansion, and a length shrinkage…But the contraction has no conceptual relationship to the Lorentz contraction.

GalAbs coordinates are used , where

$$Vobj,lab \; = \; Vobj,ae \; + \; Vae,lab \tag{26}$$

One more issue: How do we know that the platform/lab is the absolute frame, other than the predicted times and distances are experimentally verified?

The key is to accept the 3 principles:

1. The speed of light in the aether frame always equals c….

$$SoLae = Vph, ae = c \text{ ,always} \tag{27}$$

2. There is a movable aether that interacts with matter in motion

3. The lab frame is the universal frame that guarantees physical law covariance.

It is accepted that when sound travels relative to a wind, the speed of sound Vs changes because of the air motion Va. The correct value for computing the speed of sound is $Vs\ +-\boldsymbol{Va}$.

Why is there such resistance to the speed of light being

$c\ +-Vae$?

Conclusion: Einstein’s train problem with simultaneity is solved immediately and trivially. The light beam from the car’s center reaches the front and rear of the moving car in the same time as when the car was at rest. The light beam moving toward the front of the train is boosted in speed by the aether dragged by the train; the other beam is retarded by the train’s aether wash.

There’s no synchronization between locations separated in space, other than the generic aether correction in GPS range formula.

- -

Light clock model

SR view: refer to an online outline of the relativistic light clock[677]:

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[677] http://galileo.phys.virginia.edu/classes/109.mf1i.fall03 /lectures09.pdf

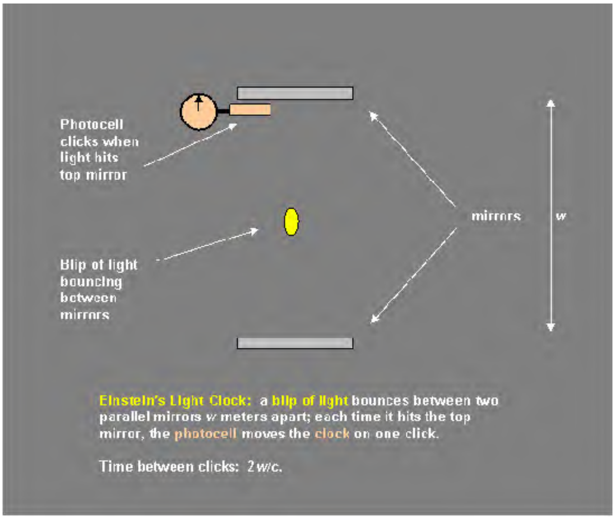
Photocell clicks when light hits top mirror
Blip of light bouncing between mirrors
mirrors
w
Einstein's Light Clock: a blip of light bounces between two parallel mirrors w meters apart; each time it hits the top mirror, the photocell moves the clock on one click.
Time between clicks: 2w/c.

Fig. 4 The light clock frame[678]

In the clock frame of Fig. 4 , the time for one trip is

$$t = w/c. \tag{28}$$

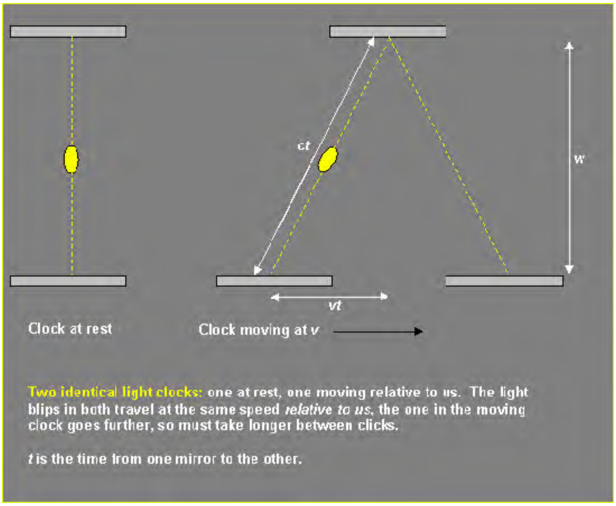
ct
w
vt
Clock at rest
Clock moving at v
Two identical light clocks: one at rest, one moving relative to us. The light blips in both travel at the same speed relative to us, the one in the moving clock goes further, so must take longer between clicks.
t is the time from one mirror to the other.

Fig. 5 The light clock lab frame[679], at right

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[678] http://galileoandeinstein.physics.virginia.edu/lectures/srelwhat_files/image016.gif

For the lab frame at the right of Fig.5:

$$c^2t^2 = v^2t^2 + w^2 \tag{29}$$

so

$$t^2(c^2 - v^2) = w^2 \tag{30}$$

or

$$t^2\left(1 - \frac{v^2}{c^2}\right) = \frac{w^2}{c^2} \tag{31}$$

Solve tor t…

$$t = \frac{w}{c}\left(1 - \frac{v2}{c2}\right)^{-1/2} \tag{32}$$

As time increases with v, this fictitious effect of stretching time is called 'time dilation'.

Why fictitious? Read on….

ALFA Model

The clock rest frame is as in SR…the analog of a boat crossing a lake. The lab frame analysis differs sharply from the relativistic view … ~ boat crossing a river.

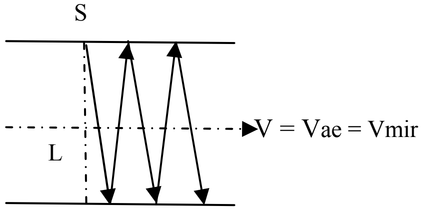

Fig. 6 Light clock lab frame

The light source S is fixed in the lab in Fig. 6. L is the spacing between mirrors. v $(= Vm)$ is the speed of the mirrors past the laser source, equal to the aether drag breeze Vae.

Because of Vae, the light beam is forced to drift a distance d when reaching the opposite mirror, in time t – see Fig. 7.

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[679] http://galileoandeinstein.physics.virginia.edu/lectures/srelwhat_files image 017.gif

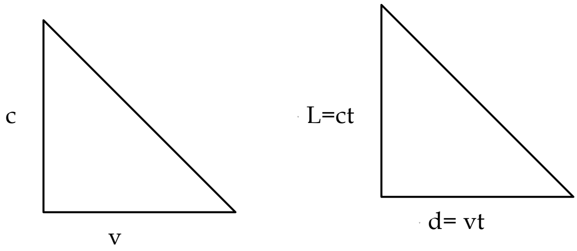


Fig. 7 Light path simplified

The light beam travels along the diagonal hypotenuse at

$$c(1+ v^2/c^2) > c \; ! \tag{33}$$

$$\text{The drift angle is } (v/c) \; . \tag{34}$$

$$d = vt \quad \text{and } t = L/c \text{, so} \tag{35}$$
$$d = (v/c)L \tag{36}$$

We will suggest a test protocol for this prediction of ALFA. But first….

Proof of the absolute frame:

1- Clock frame: the beam is always vertical; there is no drift motion sideways. So

$$v = 0 \text{ …. always.} \tag{37}$$

2- Lab frame: If the mirrors move relative to earth, then there is a

$$Vae \; != 0, \tag{38}$$

which is measured, as Wang's Fiber Optic Conveyor did.

3- SR says that if Vae is measured in the lab, then $-Vae$ will be measured in the clock frame. This contradicts #1 above; the laws of physics are invalid in the clock frame (and in any frame moving relative to Earth). Only the lab frame yields the laws of Newton and Hertz.

ALFA Light Clock test

Getting the mirrors to move at a speed v that will allow measurement of d is a practical problem.

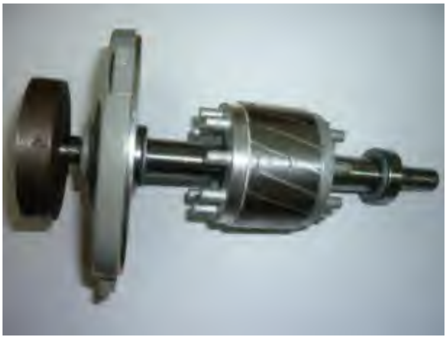
We can replace

$$Vae = Vm \tag{39}$$

with the speed of a rotor, Vr, whose linear rim velocity will create the aether breeze, as it did in the Sagnac test. The mirrors will stay at rest… and we will also test the aether entrainment claim as a bonus, by using ambient mass motion to drag the aether!

The rotor’s plane is parallel to the mirror plane; the rotor is placed above the mirror gap, so that the linear rim velocity will be focused in the mirror channel , duplicating Vae in figure 8.

Fig 8 Rotor and motor: aether motion generator



$$Vr = 2\pi rf, \tag{40}$$

the rotor’s rim velocity, now replaces $Vae(= v)$ ….
The rotor’s radius is r, the frequency f.
The drift distance d now becomes

$$d = 2\pi rf\ L/c \tag{41}$$

But what is the maximum rim velocity technically possible ?

Probably the ultrahigh centrifuge used in U_{235} separation, which reaches 1500 rps at 10 cm radius maximum, corresponding to ~900m/s or almost 1 km/s. We will try a conservative test value 1/10 that size as a reasonable design parameter….

$$Vae = Vr = 0.1\, km/s \tag{42}$$

and a mirror spacing of 3 cm = 0.03 m.

$$d \sim 0.1\, km/s * 0.03\, m/3 * 105\, km/s \sim 10 - 8\, m \tag{43}$$

$$t = L/c = 0.03\, m/3 * 108\, m/s = 10 - 10\, s. = 0.1\, nano\ sec. \tag{44}$$

Let

$$D = nd \tag{45}$$

be the detectable distance desired, and n = # of legs(one-way trips) in D.

$$D = 2\pi rf * nL/c \tag{46}$$

And

$$T = nt \tag{47}$$

is the time to reach D.

A photodetector is placed a distance D downstream from S, determined by a laser-gauge; an electronic timer measures T.

Let D be 10 cm. Then $n = cD/2\pi rfL =$

$3 * 108\, m/s * 0.1\, m/(100\, m/s * 0.03\, m) \sim 107$

.. 10 million legs (48)

The predicted time to reach D is

$T = nt = 107 * 10 - 10\, sec = 10 - 3\ sec$ … a milli sec. (49)

This seems doable ….

List of test equipment:

laser source; 2 mirrors; laser-gauge; precision timer; rotor+motor/sanding disc + electric drill; photo-detector. No interferometer is needed. Any dissident experimenters out there with spare time, an empty garage and extra cash?

Measuring Earth's 'motions'

First, note that

$$v = Vae \tag{50}$$

is directly measurable as D/T as defined above.

Choose a distance D from the source and measure T.

$$\text{Then} \quad Vae = D/T \tag{51}$$

MS claim 1: the Earth rotates
ALFA claim 1: it doesn't.

Orient the light clock N-S ... if there is no drift, then both claims are supported.

Orient the light clock E-W. If the aether wind is 0.47cos(lat) km/s West, then both claims are supported. But we showed that the light clock must use the lab as the absolute frame …..

MS claim 2: the Earth orbits the Sun.
ALFA claim 2: it doesn't

Orient the light clock in the direction of the Earth's orbit:

If the light clock measures $V = 30\ km/s$ then ALFA is refuted

If the light clock measures $V = 0\ km/s$ then MS/Galileo/Copernicus is refuted.

MS claim 3: the Earth is moving through the aether toward Leo.

ALFA claim 3: An aether stream from Leo is moving toward Earth.

Orient the light clock in the direction of Leo in the Virgo cluster:

If the light clock measures $V = 378\, km/s$, blue shifted, then nothing is proven. The relative motion of Earth and Leo will produce the CMB dipole velocity

Wrap-up

The ALFA refutation of the relativistic train and light clock thought experiments doesn't mean that anyone will now listen to logic and empirical proof, to change their own private world with its idealistic paradigm of a Carrollian Wonderland, where time has to expand, rulers shrink, and

$$c + c = c. \tag{52}$$

Welcome to MS science - Mysterious and Speculative physics. *Blinded by the light, they chose to remain in darkness.*

Appendix 4

The Origin of the Equation $E = mc^2$

Tracing the development of the famous $E = mc^2$ equation will help shed some light on the origin of Einstein's ideas. Contrary to popular opinion, $E = mc^2$ did not originate with Einstein. As van der Kamp reveals:

> And then that hackneyed combination of Einstein and the "$E = mc^2$," endlessly bandied about in popular-scientific Western folklore! True, it can be deduced from the theory, but it does not prove STR [Special Theory of Relativity], and does not depend on it, as Einstein himself has admitted. That formula has been derived in at least three non-relativistic ways, and abandonment of STR will leave that Bomb-equation unharmed. Even in a vague manner, to think that somehow Hiroshima in a most horrible way has confirmed the theory to be right is unwarranted.[680]

As for the origin of the formula, it wasn't until five years before his death (1955) that Einstein publicly attributed the basis of $E = mc^2$ to the 1862 charge-momentum field equations of James Clerk Maxwell.[681] Previous to Maxwell was the work of J. Soldner who assigned mass to light and thus could calculate its deflection in a gravitational field.[682] Michael Faraday's 1831 experiments with electricity and induction coils had already introduced the energy/mass relationship, and Maxwell put this in the reciprocal $m = E/c^2$ equation.[683] In fact, one can go back as far as

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[680] *De Labore Solis*, p. 51. Van der Kamp cites Carl A. Zappfe's *A Reminder on* $E = mc^2$ for the "three non-relativistic ways," but there are actually a half dozen or more paths to the formula. See text and footnotes.

[681] Albert Einstein, *Out of My Later Years*, Philosophical Library, New York, viii, 282, 1950. Also Edward Schilpp's, *Albert Einstein, Philosopher Scientist*, Library of Living Philosophers, 1949, p. 62, has Einstein quoted as saying: "The special theory of relativity owes its origin to Maxwell's Equations of the electromagnetic field."

[682] J. Soldner, *Berliner Astronomisches Jahrbuch*, 1804, p. 161. Also cited in *Annalen der Physik*, 65:593, 1921.

[683] The derivation of $E = mc^2$ originates from Maxwell's formula [$f = \delta E / c\delta t$] which equates the force exerted on an absorbing body at the rate energy is received by the body. Since force is also the rate of the change of momentum of

Isaac Newton in 1704 for the theoretical relationship between mass and energy.[684] Samuel Tolver Preston used the formula in 1875.[685] Julius Robert Mayer put the formula in terms of ether pressure.[686]

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the body, which, by the conservation of momentum, is also the rate of change in the momentum of the radiation, the momentum lost by the radiation is equal to 1/c times the energy delivered to the body, or M = E/*c*. If the momentum of the radiation of a mass is M times the velocity c of the radiation, the equation m = E/c^2 is derived.

[684] In Newton's Query 30 he writes: "Gross bodies and light are convertible into one another…" (*Opticks*, Dover Publications, Inc., New York, p. cxv). Newton's *Opticks* also reveal that he believed gravity would bend light. This is further evidence that many of Einstein's ideas are not original. Stephen Hawking adds that "a Cambridge don, John Michell, wrote a paper in 1783 in the *Philosophical Transactions of the Royal Society of London* in which he pointed out that a star that was sufficiently massive and compact would have such a strong gravitational field that light could not escape…A similar suggestion was made a few years later by the French scientist the Marquis de Laplace…" (*A Brief History of Time*, pp. 81-82).

[685] Preston's purpose in the paper *Physics of the Ether* was to dispel Newton's spiritualistic notion of "action-at-a-distance" and replace it with the mechanical concept of ether. The total force required in Preston's following example is said to be equivalent to $E = mc^2$.

> To give an idea, first, of the enormous intensity of the store of energy attainable by means of that extensive state of subdivision of matter which renders a high normal speed practicable, it may be computed that a quantity of matter representing a total mass of only one grain, and possessing the normal velocity of the ether particles (that of a wave of light), encloses a store of energy represented by upwards of one thousand millions of foot-tons, or the mass of one single grain contains an energy not less than that possessed by a mass of forty thousand tons, moving at the speed of a cannon ball (1200 feet per second); or other wise, a quantity of matter representing a mass of one grain endued with the velocity of the ether particles, encloses an amount of energy which, if entirely utilized, would be competent to project a weight of one hundred thousand tons to a height of nearly two miles (1.9 miles)." (S. T. Preston, *Physics of the Ether*, E. & F. N. Spon, London, 1875, #165).

[686] "If a mass M, originally at rest, while traversing the effective space *s*, under the influence and in the direction of the pressure *p*, acquires the velocity *c*, we have $ps = Mc^2$. Since, however, every production of motion implies the existence of a pressure (or of a pull) and an effective space, and also the exhaustion of one at least of these factors, the effective space, it follows that motion can never come

A curious twist in this saga occurs in 1881 with J. J. Thomson in his work with charged spherical conductors in motion, since he derived a slightly higher coefficient, $E = 4/3mc^2$.[687] The same $E = 4/3mc^2$ was found by F. Hasenöhrl in 1904 when he published the first explicit statement that the heat energy of a body increases its "mechanical" mass.[688] The 1905 Nobel Prize winner, Philipp Lenard, a stauch opponent of Einstein, was one of the first to reveal this fact in his 1921 book *Ether and Para-ether*.[689] In the book, Lenard demonstrated how simple it was to arrive at $E = mc^2$ without any reference to Relativity theory – something Einstein would also admit a few years prior to his death. In his 1929 book *Energy and Gravitation*, Lenard honored Hasenöhrl as "the first to demonstrate that energy possesses mass (inertia)."[690]

The history of the 4/3 coefficient is intriguing. Arthur Miller shows both its origin and how Einstein sought to remove it. Although Einstein purports to have legitimately removed it, Miller shows he did not succeed. Einstein had attributed the excess 1/3 to mechanical constraints, but Poincaré had demonstrated earlier that it was due to forces that avoid the explosion of the electron.[691] Engrossed in his General Relativity theory,

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into existence except at the cost of this product, $ps = Mc^2$. And this it is which for shortness I call 'force'" (J. R. Mayer, translated by J. C. Foster, "Remarks on the Mechanical Equivalent of Heat," *The Correlation and Conservation of Forces*, 1867, pp. 331, 336).

[687] Thomson's use of the formula has not escaped the notice of at least some modern physics textbooks. In *Fundamentals of Physics* by Halliday, et al, they state: "A decade before Einstein published his theory of relativity, J. J. Thomson proposed that the electron might be made up of small parts and that its mass is due to the electrical interaction of the parts. Furthermore, he suggested that the energy equals mc^2" (John Wiley, fourth edition, p. 735).

[688] Cunningham, *The Principle of Relativity*, 1914, p. 189. N. M. Gwynne, *Einstein and Modern Physics*, p. 36; F. Hasenöhrl in *Annalen der Physik*, 4, 16, 589, 1905, and Wien. Sitzungen IIa, 113, 1039, 1904. Hasenöhrl's original equation was $8E/3c^3$, which was then changed to $4E/2c^3$. Some sources have $\frac{3}{4} E=mc^2$; Kostro has $E = \frac{3}{4} mc^2$ (*Einstein and the Ether*, p. 135).

[689] Philip Lenard, *Über Äther und Uräther*, Leipzig, Verlag von S. Kirzel, 1921, cited in Kostro's *Einstein and the Ether*, p. 135.

[690] Philip Lenard, *Über Energie und Gravitation*, Berlin/Leipzig, Walter de Gruyter und Co., 1929, cited in Kostro's *Einstein and the Ether*, p. 136.

[691] Arthur I. Miller, *The Special Theory of Relativity: Emergence and Early Interpretation*, 1998, pp. 338-339. Miller writes: "But where is the 4/3-factor? It is reasonable to conjecture that by May 1907, when Einstein submitted…for publication, he knew full well that the electron's mass occurred in kinematical quantities deduced from its self-fields as 4/3 times its electrostatic mass – for example…the role of Poincaré's stress and very probably of Abraham's (1905)

Einstein did not visit the problem again. Max Von Laue demonstrated that to obtain the final formula $E = mc^2$ "one type of energy…the new physics must eliminate from its list…is kinetic energy."[692] The reason is that if mass is based on energy, as $E = mc^2$ shows, then there cannot be a kinetic energy, $K = \frac{1}{2}mv^2$, which, in turn, depends on the mass. In other words, to obtain $E = mc^2$ one must abandon the most obvious and primary form of energy, kinetic energy.[693]

Prior to this, in 1889 Oliver Heaviside used the $E = mc^2$ principle in his work with capacitors.[694] Henri Poincaré used the rudiments of the $E = mc^2$ formula long before Einstein commandeered it for his Special and General Relativity theories.[695] In 1903 the Italian scientist Olinto De Pretto

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which contained a detailed discussion of the necessity for an extra energy to correct the Lorentz-electron's total energy. In fact, Einstein may well have avoided the particular example of Lorentz's electron because of his having been unable to deduce the 4/3-factor from the relativistic kinematics."

[692] Max von Laue in *Albert Einstein: Philosopher Scientist*, ed., P. A. Schlipp, 1988, p. 529. He continues: "…we must explain why Abraham's model of the electron as well as cavity radiation yield the different relationship $m = (4/3)\,(E_0/c^2)$. The reason is the same in both cases. The electromagnetic field is not capable of existing by itself alone, it requires certain supports of a different nature. Cavity radiation can exist only within an envelope, and the charged sphere would fly apart if it were not for certain cohesive forces. In both cases, motion will give rise to an energy current within the material supports which is directed opposite to the motion. It contributes to the total momentum a negative amount and reduces the factor 4/3 to 1" (*ibid*., pp. 528-529).

[693] This discrepancy can be seen, for example, in the kinetic energy of the electron in the hydrogen atom compared to the speed of light. The ionization energy of the electron is 13.6 eV or 2.17×10^{-18} joules. Transposing $K = \frac{1}{2}mv^2$ to $v = (2K/m)^{1/2}$, and then making the binding energy of the electron equal to the ionization energy, we have $v = (2 \times 2.17 \times 10^{-18}\ \mathrm{J} / 9.1 \times 10^{-31}\ \mathrm{kg})^{1/2} = 2.18 \times 10^6$ meter/second as the velocity of the electron, but this value is 137.6 times slower than *c*, the speed of light.

[694] *The Flash of the Cathode Rays: J. J. Thomson and His Contemporaries*, 1998, by Per F. Dahl: "...not only did Thomson anticipate Einstein's mass-energy equivalence by 24 years...the expression was also anticipated by Oliver Heaviside in 1889." See also David Bodanis' book, *$E=mc^2$: A Biography of the World's Most Famous Equation*. See a critique of Bodanis' book by Hans Melberg, *How Much Gossip is Required Before Science Becomes Interesting*, Walker Publishing, 2000.

[695] In his 1900 paper "The Theory of Lorentz and the Principle of Reaction," Poincaré derived the expression $M = S/c^2$, representing *M* as the momentum of radiation, *S* as its flux, and *c* as the velocity of light. Poincaré reasoned that, since electromagnetic energy behaved like a fluid with inertia, if it is discharged from a source there must be a recoil, just as there is a recoil when a ball is shot from a

cannon. Using μ for the mass of the recoiling body, and v for its velocity, the equation is $\mu v = S/c^2$. Since $S = Ec$, we have $\mu v = Ec/c^2 = E/c^2$ times c, where the E/c^2 represents the role of mass. When $v = c$, the equation reduces to $E = mc^2$. Poincaré also developed the concepts of relativity and the limit of light's velocity. Einstein makes no reference to Poincaré in his famous 1905 paper, or anyone else. This is all the more significant since Poincaré wrote 30 books and 500 papers, none of which Einstein claimed to have read. Perhaps Poincaré returned the favor to Einstein since, until his death in 1912, he only mentioned Einstein's name in print once, and that was to register an objection (Holton, *Thematic Orgins of Scientific Thought*, p. 249). Regarding the 1905 paper, Clark, an admirer of Einstein, states: "…it was in many ways one of the most remarkable scientific papers that had ever been written. Even in form and style it was unusual, lacking the notes and references which give weight to most serious expositions and merely noting, in its closing paragraph, that the author was indebted for a number of valuable suggestions to his friend and colleague, M. Besso" (*Einstein: The Life and Times*, p. 101). Later, however, Einstein eliminated Besso's name from a paper he submitted to the Berlin Academy in 1915 regarding the perihelion of Mercury, even though the equations were "simply to redo the calculation he had done with Besso in June 1913" (Michel Janssen, "The Einstein-Besso Manuscript," p. 15). As for the 1905 paper, how it is that a 9,000 word paper on one of the most controversial ideas ever presented to mankind made it past the editor of *Annalen der Physik*, the world's leading physics periodical, is anyone's guess. The most likely reason is that Max Planck, the chief editor of *Annalen* in 1905, published it due to his total acceptance of Special Relativity, which he demonstrated by defending it against Kaufmann in 1906. In any case, an editor of a prestigious physics journal should want to know whether anyone prior to Einstein had written about the ideas being presented, especially since the editors themselves were very familiar with the work of Lorentz and Poincaré. When asked about whether his 1905 paper was guilty of plagiarism, Einstein retorted in his 1907 paper: "It appears to me that it is the nature of the business that what follows has already been partly solved by others. Despite that fact, since the issues of concern are here addressed from a new point of view, I am entitled to leave out a thoroughly pedantic survey of the literature…" (Über die vom Relativitätspringzip geforderte Trägheit der Energie," *Annalen der Physik* 23 (4), p. 373). Yet in a 1935 paper Einstein admitted: "…because the *Lorentz transformation, the real basis of special relativity theory…*" ("Elementary Derivation of the Equivalence of Mass and Energy," *Bulletin of the American Mathematical Society* 61:223-230; first delivered as The Eleventh Josiah Willard Gibbs Lecture at a joint meeting of the American Physical Society and Section A of the AAAS, Pittsburgh, December 28, 1934, emphasis Einstein's). There was hardly any way to avoid this realization, since Lorentz's Transformation equation is identical to the equation for Einstein's Special Relativity. My thanks to Richard Moody in *Nexus Magazine*, vol. 11, no. 1, Dec.-Jan. 2004 for many of the above quotes. Against all this is Gerald Holton's view that Einstein never read Lorentz and Poincaré before 1905; that Einstein showed "painful honesty," and that "the had already published $E = mc^2$ two years before Einstein did, but Einstein did not mention De Pretto in his 1905 paper on Special Relativity, which is odd considering that he spoke fluent Italian and, by his own admission, read all the Italian physics journals.[696] In 1907, Max Planck, expanding the work of Hasenöhrl and using Poincaré's momentum of radiation formula, gave the final derivation of the $E = mc^2$ formula.[697] All in all, $E = mc^2$ is readily derivable apart from the theory of Relativity, as both Joseph Larmor in 1912; Wolfgang Pauli in 1920, Philipp Lenard in 1921, and M. Simhony in 1994, demonstrated independently.[698]

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so-called revolution which Einstein is commonly said to have introduced into the physics in 1905 turns out to be at bottom an effort to return to a classical purity" (*Thematic Origins of Scientific Thought*, pp. 199, 200, 195 in order of ellipses).

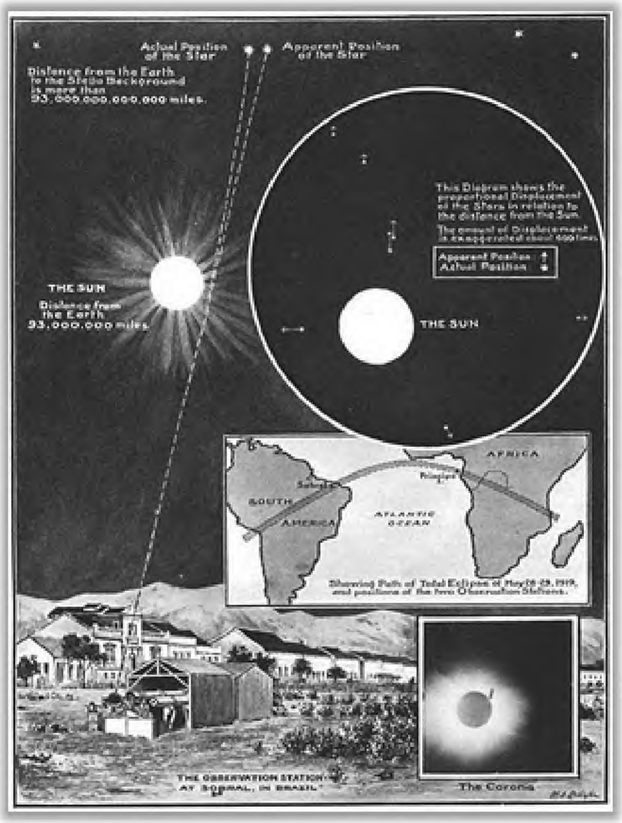
[696] Umberto Bartocci, Professor of Mathematics at the University of Perugia, Italy, in his book, *Albert Einstein E Olinto De Pretto: la vera storia della formula piu' famosa del mondo* (translated: "Albert Einstein and Olinto De Pretto, the true history of the most famous formula in the world," Societa Editrice Andromeda, via S. Allende1, 40139) provides documentation that De Pretto published an article in which he gave, in its final form, the equation $E = mc^2$. This article was published on June 16, 1903, and published again in February 27, 1904, the second time in the Atti of the Reale Instituto Veneto di Scienze. De Pretto thereby preceded Einstein's famous 1905 $E = mc^2$ paper by at least a year and half. Could Einstein have copied from De Pretto? No one can prove definitively that Einstein saw De Pretto's article, but Professor Bartocci offers some intriguing speculation. Professor Bartocci traced a link between De Pretto and Einstein, through Einstein's best friend, Michele Besso. As we noted, Besso is the only person credited in the famous $E = mc^2$ paper of 1905. See also R. Carroll's, "Einstein's $E = mc^2$ 'was Italian's idea,'" (*The Guardian*, Nov. 11, 1999, cited in Moody).

[697] Planck writes: "…through every absorption or emission of heat the inertial mass of a body alters, and the increment of mass is always equal to the quantity of heat…divided by the square of the velocity of light *in vacuo*" (M. Planck, Sitz. der preuss. Akademie der Wissenschaften (Berlin), Physik. Math. Klasse. 13 (June, 1907), p. 566. Regarding Einstein's 1905 paper (*Annalen der Physik* 18, 639), Planck shows that, although Einstein came to "essentially the same conclusion by application of the relativity principle to a special radiation process," he did so *by assuming* the existence of one of the mathematical components. Thus Planck continues, "however under the assumption permissible only as a first approximation, that the total energy of a body is composed additively of its kinetic energy and its energy referred to a system with which it is at rest" (cited in *The Einstein Myth and the Ives Papers*, Part II, p. 185).

[698] Larmor in "On the dynamics of radiation," *Proc. Intern. Congr. Math.*, Cambridge, 1912, p. 213; W. Pauli, Jr., "Relativitätstheorie," Encyclopedia Math. Wiss. V-2, hft 4, 19, 679, 1920, as reported by Herbert Ives in *Journal of the Optical Society of America* 42: 540-543, 1952, and cited in *The Einstein Myth*, pp. 84, 109, 184.

Appendix 5

Do the 1919 Eclipse Photographs Prove General Relativity?


Actual Position of the Star
Apparent Position of the Star
Distance from the Earth to the Stellar Background is more than 93,000,000,000,000 miles.
THE SUN
Distance from the Earth 93,000,000 miles.
This Diagram shows the proportional Displacement of the Stars in relation to the distance from the Sun.
Apparent Position
Actual Position
THE SUN
AFRICA
Principe
Sobral
SOUTH AMERICA
ATLANTIC OCEAN
Showing Path of Total Eclipse of May 28-29, 1919, and positions of the two Observation Stations.
THE OBSERVATION STATION AT SOBRAL, IN BRAZIL.
The Corona

As we noted earlier, Einstein desperately needed some physical proof that gravity bent light in the exact proportion his General Relativity theory predicted so that he could give credence to the idea that gravity and acceleration were equivalent phenomena. In a letter to Ernst Mach he stated that the eclipse results would determine “whether the basic and fundamental assumption of the equivalence of the acceleration of the reference frame and of the gravitational field really holds."[699] Although a bending of light by gravity would not necessarily prove General Relativity (since non-Relativistic theories could also explain it), it would at least give it enough plausibility to pass the muster of an adoring public. But the physical evidence supporting General Relativity was one of the more biased campaigns of human advertisement the world has witnessed. As one author writes: "In 1911 Einstein predicted how much the sun's gravity would deflect nearby starlight and got it wrong by half."[700] Another from the same magazine writes:

> His second prediction, that light from distant stars would be deflected by the warped space-time around the sun, catapulted him to world fame in 1919, when observations of a solar eclipse seemed to confirm his prediction. But as historians have since shown, the 1919 measurements were equivocal at best.[701]

Paul Marmet adds:

> "…all the experiments claiming the deflection of light and radio waves by the Sun are subjected to very large systematic errors, which render the results highly unreliable and proving nothing" and concluding in his 23-page paper with: "Much of the popularity of Einstein's general theory of relativity relies on the observations done at Sobral and Principe. We see now that these results were overemphasized and did certainly not consecrate Einstein's theory. It is interesting to think of what would have happened if the results had been deemed not good enough…"[702]

Einstein, however, regarded the solar eclipse results of 1919 as irrefutable evidence for his General Theory of Relativity, for it was reputed to prove that gravity bent starlight by precisely the amount predicted by the theory. In his 1920 book *Relativity: The Special and the General Theory*, he wrote:

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[699] *Thematic Origins of Scientific Thought*, p. 254.

[700] Karen Wright, *Discover* magazine contributing editor, "The Master's Mistakes," September 2004, p. 50. This would be no surprise to many today.

[701] Robert Kunzig, *Discover* magazine contributing editor, "Testing the Limits of Einstein's Theories," September 2004, p. 54.

[702] Paul Marmet in "Relativistic Deflection of Light Near the Sun Using Radio Signals and Visible Light," writes in his abstract: (Physics Dept., University of Ottawa, no date given at www.newtonphysics).

> The relative discrepancies to be expected between the stellar photographs obtained during the eclipse and the comparison photographs amounted to a few hundredths of a millimetre only. Thus great accuracy was necessary in making the adjustments required for the taking of the photographs, and in their subsequent measurement… The results of the measurements confirmed the theory in a thoroughly satisfactory manner."[703]

Previous to this, in 1913 Einstein employed Erwin Freundlich to detect a bending of starlight near the sun, but his photographs failed to provide any such evidence. After this failure, Einstein confided to Freundlich: "If the speed of light is in the least bit affected by the speed of the light source, then my whole theory of relativity and theory of gravity is false."[704] Perhaps this is why in March 1914 Einstein seemed a bit more unconcerned in a letter to his best friend, Michael Besso, stating:

> Now I am fully satisfied, and I do not doubt any more the correctness of the whole system, may the observation of the eclipse succeed or not. The sense of the thing is too evident."[705]

When asked what he would do if the eclipse results were not in his favor, Einstein retorted with one of his more famous quips: "Then I would have been sorry for the dear Lord – the theory is correct."[706] Unless Einstein was joking, this statement shows he had already set in his mind that Relativity was correct before the 1919 eclipse experiments were performed. Eddington also caught this fever. As Stephen Brush states: "Eddington…was already convinced of the truth of Einstein's theory before making the [eclipse] observations."[707] Clark reports much the same:

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[703] Albert Einstein, *Relativity: The Special and the General Theory*, trans. Robert W. Lawson, 1961, Appendix III, pp. 146-147. On the other hand, Einstein admitted: "This awareness of my limitations pervades me all the more keenly in recent times since I see that my faculties are being quite particularly overrated after a few consequences of the general theory stood the test" (letter from Einstein to Lorentz, January 19, 1920, translated by A. Hentschel, *The Collected Papers of Albert Einstein*, Vol. 9, Doc. 265, Princeton Univ. Press, 2004, p. 220).

[704] *Einstein: The Life and Times*, p. 207.

[705] *Thematic Origins of Scientific Thought*, p. 254.

[706] Einstein's answer to the question from doctoral student Ilse Rosenthal-Schneider, in 1919. Quoted in Rosenthal-Schneider, *Reality and Scientific Truth*, p. 74, as cited in *The Expanded Quotable Einstein*, p. 238. Ilse was one of Einstein's love interests prior to his divorce from Mileva Marić. He eventually married Ilse, only after giving the brush off to Ilse's daughter, Elsa. See Volume II, pp. 39-48.

> Eddington's enthusiasm for the General Theory was illustrated when Cottingham asked, in Dyson's study: "What will it mean if we get double the Einstein deflection?" "Then," said Dyson, "Eddington will go mad and you will have to come home alone."[708]

According to C. W. F. Everitt, a detailed reading of the reports on the 1919 eclipse observations

> leads only to the conclusion that this was a model of how not to do an experiment…It is impossible to avoid the impression – indeed Eddington virtually says so… that the experimenters approached their work with a determination to prove Einstein right. Only Eddington's disarming way of spinning a yarn could convince anyone that here was a good check of General Relativity. The results of later eclipse expeditions have been equally disappointing."[709]

Although Einstein and Eddington were so self-assured, many anomalies and suspicions revolve around May 29, 1919's eclipse photographs. Along with Eddington were three other celebrated British astronomers: Andrew Crommelin, E. T. Cottingham and C. R. Davidson. Eddington and Cottingham did their observations on Principe Island in West Africa, while Crommelin and Davidson did theirs at Sobral, Brazil. Charles Lane Poor offers some sobering comments:

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[707] Stephen Brush, *Why Was Relativity Accepted?* p. 201.

[708] *Einstein: The Life and Times*, p. 285.

[709] C. W. F. Everitt, "Experimental Tests of General Relativity: Past, Present and Future," in Riazuddin, ed., *Physics and Contemporary Needs*, vol. 4, 1980, pp. 529-555. S. Chandrasekhar writes of Eddington: "…had he been left to himself, he would not have planned the expeditions since he was fully convinced of the truth of the general theory of relativity!" (S. Chandrasekhar, *Eddington: The Most Distinguished Astrophysicist of His Time*, 1983, p. 25).

> The mathematical formula, by which Einstein calculated his deflection of 1.75 seconds for light rays passing the edge of the sun, is a well known and simple formula of physical optics. Not a single one of the concepts of varying time, or warped or twisted space, of simultaneity, or of the relativity of motion is in any way involved in Einstein's prediction of, or formulas for, the deflection of light. The many and elaborate eclipse expeditions have, therefore, been given a fictitious importance. Their results can neither prove nor disprove relativity theory…. The actual stellar displacements, if real, do not show the slightest resemblance to the predicted Einstein deflections: they do not agree in direction, in size, or the rate of decrease with distance from the sun."[710]

Einstein had referred to 1.7 seconds of arc in his book on Relativity:

> …according to the general theory of relativity, a ray of light will experience a curvature of its path when passing through a gravitational field, this curvature being similar to that experienced by the path of a body which is projected though a gravitational field. As a result of this theory, we should expect that a ray of light which is passing close to a heavenly body would be deviated towards the latter. For a ray of light which passes the sun at a distance of Δ sun-radii from its center, the angle of deflection (a) should amount to 1.7"/Δ. It may be added that, according to the theory, half of this deflection is produced by the Newtonian field of attraction of the sun, and the other half by the geometrical modification ("curvature") of space caused by the sun.[711]

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[710] "The Deflection of Light as Observed at Total Solar Eclipses," 1930, *Journal of the Optical Society of America* 20:173-211.

[711] Albert Einstein, *Relativity: The Special and the General Theory*, 1961, Appendix III, p. 145. Johann Georg von Soldner (d. 1833) had already predicted a bending of light around the sun of 0.875 arc seconds, all without the use of Relativity. Einstein doubled Soldner's figure to 1.75'', claiming that 0.875 was attributable to Newtonian physics, but the remaining 0.875 was attributable only to Relativity's "space curvature." Paul Marmet adds: "This amount [1.75''] is twice the one predicted by Einstein in 1908 [A. Einstein, "Jahrbuch der Radioaktiviät und Elektronik," 4, 411, 1908] and in 1911 [A. Einstein, "Über den Einfluss der Schwerkraft auf die Ausbreitung des Lichtes," *Annalen der Physik*, 35, 898, 1911] using Newton's gravitational law. In 1911, Einstein wrote: 'A ray

Although Einstein predicted the deflection of starlight at the surface of the sun should be 1.75 seconds of arc, what the reports do not readily reveal is that evidence from the 1919 expedition showing deflections greater or less than 1.75 seconds were rejected as "spurious." Even though Einstein insisted "…great accuracy was necessary in making the adjustments required for the taking of the photographs, and in their subsequent measurement," Poor discovered that Eddington discarded 85% of the data from the eclipse photographs taken at Sobral, Brazil, due to "accidental error." The truth is that the displacements of the stars were in every conceivable direction, some in the exact opposite position predicted by Relativity. At a meeting of the Royal Astronomical Society in 1919, Ludwik Silberstein revealed that the displacements were not radial as Einstein's theory claims, often deflecting from the radial direction by as much as 35°, leading Silberstein to conclude: "If we had not the prejudice of Einstein's theory we should not say that the figures strongly indicated a radial law of displacement."[712] As noted, only 15% of the displacements were consistent with Einstein's prediction. After providing the reader with Table III from the official Report of the expeditions,[713] Poor reveals the numerous discrepancies:

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of light going past the Sun would accordingly undergo deflexion to an amount of 4×10^{-6} = 0.83 seconds of arc. Let us note that Einstein did not clearly explain which fundamental principle of physics used in the 1911 paper and giving the erroneous deflection of 0.83 seconds of arc was wrong, so that he had to change his mind and predict a deflection twice as large in 1916" ("Relativistic Deflection of Light Near the Sun Using Radio Signals and Visible Light," Physics Dept. University of Ottawa, www.newtonphysics, p. 15).

[712] Royal Astronomical Society, December 12, 1919, as cited in *The Observatory*, 43, 548, pp. 33-45, January 1920.

[713] Under the title: "Radial Displacement of Individual Stars," the following information was given in the "Report" authored by Dyson, Eddington and Davidson and presented to the Royal Astronomical Society:

Star	**Calculation**	**Observation**
11	0.32"	0.20"
10	0.32"	0.32"
6	0.40"	0.56"
5	0.53"	0.54"
4	0.75"	0.84"
2	0.85"	0.97"
3	0.88"	1.02"

This table shows that, on the average, the observed deflection, as given by the British astronomers, differs by 19% from the calculated Einstein value [1.75”]. In the cases of two stars, the agreement between theory and observation is very nearly perfect, the observed value being only 3% in error: in other cases, however, the differences range from 11% to 60% [and] the rate of decrease from star to star is radically different from that predicted. The difference between the deflection of the star nearest the sun and that of the farthest star should be, according to Einstein, 0.56”; while the observed or measured difference was 0.82”, practically 50% out of the way. *The diagrams…show clearly that the observed displacements of the stars do not agree in direction with the predicted Einstein effect.* This point was nowheres [sic] mentioned in the Report, which took up only the amount of the radial component of the actual displacement. But, after the measurements of the plates became available for study, several investigators called attention to this fact of a radial disagreement in direction between the observed and predicted displacements…in the case of the star furthest from the sun to 37°. Thus, even the seven best plates out of thirty-three, which showed star images, give inconsistent results: the observed shifts in the star images, if real, *do not coincide with the Einstein effect either in amount or direction.*[714]

It has been claimed by many that the differences between the observed and predicted shifts are no greater than should be expected…Now this very question was investigated by Dr. Henry Norris Russell, of Princeton University, a most ardent upholder of relativity theory. He studied these star displacements with a view of determining whether the departures from Einstein’s predicted effects are real or not, and, if real, of finding some possible explanation for them. As a result of an exhaustive examination of them, he concludes that these differences between the observed and predicted displacements, these non-Einstein displacements, as he calls them, are *real*, and cannot be attributed to mere accidental errors of observation and measurement…Dr. Russell assumes that the most probable

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[714] *Gravitation versus Relativity*, pp. 218-219, emphasis added.

> source of these proved non-Einstein deflections is to be found in instrumental errors: in an alteration in the shape of the mirror, caused by the heat of the sun…But one point is perfectly clear. If it be admitted that the heat of the sun so distorted the mirror of the apparatus as to cause errors of 20%, in some cases of 50%, of the measured displacement, then the entire set of plates is worthless for proving the existence or non-existence of the "Einstein effect."[715]

After providing the reader with the results of the photographic plates at both Sobral and Principe,[716] Poor offers the following analysis:

> These results, in each case, are the means [average] of the radial components only; nothing whatever being given as to the directions in which the actual displacements took place. The Einstein theory requires a deflection, not only of a certain definite amount, but also in a certain observed direction. To discuss the amount of the observed deflection is to discuss only one-half of the whole question, and the less important half at that. The observed deflection might agree exactly with the predicted amount; but, if it were in the wrong direction, it would disprove, not prove, the relativity theory….Now, the diagrams…of the seven best plates, the seven taken at Sobral with the 4-inch camera, *show clearly and definitely that the observed deflections are not in the directions required by the Einstein theory*…not only that, but every one of the seven plates shows the star deflected in the same direction from that called for by the relativity theory. Similarly for star No. 11, every dot again lies on the same side of the Einstein arrow, and the mean deflection differs by 37° from the predicted. In this case two of the individual plates give deflections practically in the reverse direction to that called for by the theory. The best agreement between theory and observation is given by star No. 4, where the mean difference amounts to about a single degree: but, even in

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[715] *Ibid*., pp. 220-222, emphasis added.

[716] (1) Sobral, 4-inch camera, 7 plates = 1.98" with probable error of about ± 0.12"; (2) Principe, 13-inch astrographic lens, 2 plates = 1.61" with probable error of about ± 0.30"; (3) Sobral, 13-inch astrographic lens, 16 plates = 0.93" with the Report stating: "For reasons already described at length not much weight is attached to this determination."

this case, the individual results differ by as much as 30°. The relativist either totally disregards these discordances in the directions of the observed deflections, or invokes the heating effect of the sun to distort the mirror by just the proper amount to explain them away![717]

Again, disregarding directions entirely, and taking into account only the size of the deflection, it is noted that the disagreement between the three mean results, as given in the Report, is over 100%; the largest value being well over twice that of the smallest. The actual amount of the deflection as obtained with the astrographic lens is 58% of that obtained at Principe and only 47% of that of the 4-inch camera at Sobral. This difference in results is far beyond the limits of accidental errors.[718]

When the deflections of light, as actually observed, are considered both in direction and in amount, the discordances with the predicted Einstein effect become marked, and the plates present little or no evidence to support the relativity theory. Further, if these deflections are real, and not due to instrumental errors (so readily called upon by the relativist to explain everything that the relativity theory cannot account for) then it has not yet been shown that the relativity theory is the only possible explanation. As a matter of fact there are other perfectly possible explanations of a deflection of a ray of light; explanations based on every-day, common-place grounds. Abnormal refraction in the Earth's atmosphere is one; refraction in the solar envelope is another. The atmospheric conditions under which the eclipse plates were taken were necessarily abnormal; and the plates, themselves, clearly show that the rays of light passed through a mass of matter in the vicinity of the sun; a mass of density sufficient to clearly imprint its picture upon the photographic plates. Such is the evidence, and are the observations, which, according to Einstein, "*confirm the theory in a thoroughly satisfactory manner*."[719]

In his 1970 book, Leon Brillouin made a similar critique:

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[717] *Gravitation versus Relativity*, pp. 223-225, emphasis added.
[718] *Gravitation versus Relativity*, p. 225.
[719] *Gravitation versus Relativity*, p. 226.

> These were very inaccurate experiments with individual errors of 100% and averaged errors of 30%. The theory is not safe because it assumes an ideal vacuum near the sun's surface, while we can observe very powerful explosions of matter and radiations from the sun.[720]
>
> Einstein predicts the deflection of a light ray passing near the surface of the sun, but we obtain a similar result if we consider a light ray as a beam of photons hv with masses hv/c^2. Only the numerical coefficient is different, and Einstein's prediction is twice as large as that in the computation with photons. Here the experimental results are actually very poor with errors of 100% magnitude…looking candidly at these observations, one feels that very large sources of error are obviously playing a substantial role, and our present knowledge of the turbulent flow in the solar atmosphere yields the most probable explanation. The Shapiro experiment is certainly safer than the deflection of light rays.[721]

Poor's explanation is even more detailed, showing from the science of optics what is a perfectly logical explanation to the many and varied deflections obtained in Eddington's series of photographs:

> The Sobral photographs show clearly that the rays of light, in their course from the distant stars, passed through masses of matter near the sun. This matter was sufficiently dense and reflected enough sunlight to imprint its image upon the photographic plates, and there can be no question as to its existence and its presence in the paths of the light rays. Further, whenever a ray of light passes from free space into, or through a medium of any kind of density, such ray is refracted, or bent out of its straight course. The path of such a ray becomes curved, and the amount of refraction, or curvature, depends on the density of the medium into which the ray passes and the angle at which it meets the surface. This is the fundamental law of physics: upon the refractive effects of different media are based our optical instruments and experiments: eye-glasses, cameras, microscopes, telescopes; all depend upon the refractive effect of

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[720] Leon Brillouin, *Relativity Reexamined*, NY, Academic Press, 1970, p. 54.
[721] *Ibid*., p. 98.

glass upon the ray of light. It is certain, therefore, that the rays of light, in passing through the solar envelope, suffered a refraction, or bending, of some kind and amount. This fact is as well established as the sun itself. The sole question is whether this refraction was sufficient in amount and in direction to account for the observed displacements of the star images. This possibility of accounting, in a perfectly normal way, for the observed light deflections has been dismissed by the relativist in a few words as a matter scarcely worth mentioning.[722]

While it is certain that the rays suffer some refraction in passing through the solar envelope, it is claimed by most astro-physicists that the effect is so small as to be negligible in comparison with the observed deflections. This idea is so firmly fixed that the possibility of explaining any portion of the deflections by refraction was dismissed by the British astronomers in their Report with a scant phrase or two. The entire question depends upon the possibility of the solar envelope having density large enough to bend a ray of light by the required amount, and this in turn upon what that density really is. It can readily be shown by the ordinary formulas of optics that a lens of matter of a density of about 1/140th that of air at standard pressure and temperature would deflect a ray of light by about 1”, the amount observed in the case of the star nearest the sun.[723]

While, thus, there is a very open question as to the amount of refraction which would be caused by a medium of varying density, there is on the other hand practically no question as to the direction in which the bending will take place. This is purely a matter of geometry, and depends upon the fundamental law, that the incident ray, the normal to the surface, and the refracted ray, all lie in the same plane….In the case of the photographs taken at Sobral during the eclipse of May 29, 1919…an approximate solution can be made with great simplicity. For, assuming the solar envelope to be an ellipsoid of revolution with

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[722] *Gravitation versus Relativity*, p. 240.

[723] *Ibid*., pp. 240-241.

> its axis coinciding with that of the sun, the axis of figure would be practically at right angles to the line of sight.[724]

In light of Poor's devastating analysis, Sir John Maddox, editor of *Nature*, wrote: "They [Crommelin and Eddington] were bent on measuring the deflection of light….What is not so well documented is that the measurements in 1919 were not particularly accurate."[725] G. Burniston Brown adds:

> Initially stars did appear to bend as they should, as required by Einstein, but then the unexpected happened: several stars were then observed to bend in a direction transverse to the expected direction and still others to bend in a direction opposite to that predicted by relativity."[726]

Scientific American, obtaining their report directly from Crommelin's own words, shows that even the photograph used for the tally had a significant margin of error:

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[724] *Ibid.*, pp. 247-248. Poor then adds three tables which show the contrasting results between Einstein's relativity and Poor's refractive index of the solar envelope and residual matter. Regarding Table IV of the perihelia of Mercury, Venus, Earth and Mars, using the sum of squares to gauge the accuracy of the results, Einstein's theory comes in at a whopping 473 off the observed values, while Poor's is only 14 (*ibid.*, p. 234). Regarding Table VI of the stars' Computed Departures from Radiality, Einstein's theory deviates by 2,489 from observed values, while Poor's only by 410 (*ibid.*, p. 251). In regard to Longitude of Node and Inclination, Poor's results come within 84% and 80%, respectively, when compared to Newcomb's observational figures published in 1895 (*ibid.*, p. 253). As N. Martin Gwynne notes: "The reader will doubtless not be surprised to learn that the predictions resulting from Poor's formula were many, many times more accurate than those produced by Relativity Theory. Moreover the same explanation (the assumption of the self-same solar atmosphere), enabled him also to predict correctly the perihelion of Mercury and without, incidentally, being thrown into confusion by the perihelia of the other planets. The same assumption, in other words, gave as satisfactory an answer as could be desired in two radically different investigations" (private paper).

[725] "More Precise Solar-limb Light Bending," *Nature* 377:11, 1995.

[726] "What is Wrong with Relativity," *Bulletin of the Institute of Physics and Physical Society*, 1967, pp. 71-77.

> The resulting shift at the limb is 1.98'', with a probable error of 0.12''. It will be seen that this result agrees very closely with Einstein's predicted value of 1.75''.[727]

Eddington's experimental results from Principe Island, West Africa are dubious at best. On the day of the eclipse, May 29, 1919, the team was greeted with heavy rain. According to Clark, events occurred with a lick and a promise:

> Not until 1:30 P.M., when the eclipse had already begun, did the party get its first glimpse of the sun. "We had to carry out our programme of photographs on faith," wrote Eddington in his diary. "I did not see the eclipse, being too busy changing plates, except for one glance to make sure it had begun and another halfway through to see how much cloud there was. We took sixteen photographs. They are all good of the sun, showing a very remarkable prominence; but the cloud has interfered with the star images. The last six photographs show a few images which I hope will give us what we need…".[728]

One might think that the mission would have been aborted, considering the minimal number of samples Eddington managed to put together. Of the six salvageable photographs, Eddington admits, seemingly without the slightest shame, that he based his conclusion on *only one of the six salvageable photographic plates*, while he rejected the other plates that did not give the results he expected. As he records it: "But one plate that I measured gave a result agreeing with Einstein," from which he then exclaims, "it was the greatest moment of [my] life."[729] But even Relativists admit: "…it is absolutely crucial to obtain as many photographs with as many star images as possible. To this end, of course, it helps to have a clear sky."[730] When compared to a June 30, 1973 expedition led by Burton F. Jones that "hoped to gather over 1,000 star images,"[731] this makes Eddington's adventure into a virtual sham. Incidentally, Will reveals that the results of the 1973 eclipse showed 0.95 ± 0.11 arc seconds times Einstein's figure of 1.75, thus offering what he says is only a "modest improvement." With such a wide deviation, not surprisingly, the 1973 expedition was called the "swan song for this type of measurement."[732] That the public could be bamboozled in 1919 into believing that Relativity was proven by one mere photograph, which in itself was interpreted with obvious bias, and in the midst of five others that clearly nullified the theory, shows the influence Eddington carried in that day, as well as the utter mystique of the Relativity theory.

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[727] *Scientific American Supplement*, December 6, 1919, as cited in *Scientific American*, September 2004, p. 104.

[728] *Einstein: The Life and Times*, p. 285.

[729] *Einstein: Life and Times*, pp. 285-286. The photographic plate considered as successful measured a displacement of 1.61'' ± 0.30''. So even in the plate he depended on to "prove" Relativity, it is only the margin of error (0.30'') Eddington granted to himself for the final calculations that brought the result within respectable range of Einstein's 1.75'' prediction. If Eddington had taken the minus side of the margin of error, the result would have been a dismal 1.31'' and no confirmation of Relativity could be extracted from it. In any case, the other five plates that Eddington discarded measured 0.93'' or less. In proper scientific procedure, it is the five measuring 0.93'' or less which would serve as the control and the 1.61'' as the anomaly, but Eddington conveniently reversed that protocol.

The questionable tactics that occurred in the 1919 eclipse expeditions also occurred in 1922 efforts in Australia. After putting the evidence of their photographs on a graph, the results show 44 data points below the curve and only 25 points above, which means that whoever created the graph did not choose the proper median curve, apparently in order to give the impression that the results conformed with Relativity theory. As Arthur Lynch writes:

> The results of the observations are shown on a chart, by a series of dots, and by tracing connections between these dots it is possible to obtain a "curve" from which the law of deviation is inferred. But the actual charts show only an irregular group of dots, through which, if it be possible to draw a curve that seems to confirm the theory of Relativity, it is equally possible to draw

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It just so happens that a deflection of 0.93'' is almost identical to the prediction of Newtonian physics and astronomically far from Einsteinian physics.

[730] Clifford M. Will, *Was Einstein Right? Putting Relativity to the Test*, New York: Basic Books, Inc., Publishers, 1986, p. 77.

[731] *Was Einstein Right*? p. 80.

[732] *Ibid*., p. 80. B. F. Jones' paper, "Gravitational deflection of light: solar eclipse of 30 June 1973. Plate reductions, says "About 160 stars were measured on each plate." But the paper reveals that, no matter how careful the experiments were conducted, they were not able to get the Einstein figure of 1.75. Jones shows low readings from a PDS microphotometer of 1.49 ± 0.20 to a high of 1.89 ± 0.18, concluding at the end of the paper that a "1.66 ± 0.18 arcsec" is the final averaged result (*The Astronomical Journal*, Vol. 81, No. 6, June 1976, pp. 455-463).

> a curve which runs counter to the theory. Neither curve has any justification.[733]

Sir Edmund Whittaker, who wrote one of the more popular yet comprehensive volumes on the history of physics, and who was no enemy of Relativity, nevertheless stated in 1952:

> While it must not be regarded as impossible that the consequences of Einstein's theory may ultimately be reconciled with the results of observations, it must be said that at the present time there is a discordance.[734]

Despite these discrepancies, American astronomer W. W. Campbell made an announcement in 1923 that Einstein's predictions had been confirmed by the 1922 results.

Astronomer Robert Dicke (who, *contra* Relativity, revealed that Mercury's perihelion was due in part to the sun's oblateness), writes:

> Owing to the short duration of the eclipse and the consequent absence of repetitions of the observation, there has always been considerable doubt about the freedom of the final results from systematic errors. Furthermore, the results derived from past solar eclipses…have scattered a great deal. The accuracy of the gravitational deflection of light determined from total eclipses is probably no better than 20 per cent."[735]

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[733] Arthur Lynch, *The Case Against Einstein*, p. 264. F. Schmeidler of Munich University Observatory did a similar plot of the 92 stars from the 1922 photos, a plot which showed the same helter-skelter results ("The Einstein Shift an Unsettled Problem," *Sky & Telescope*, 27(4), 217, 1964).

[734] Edmund T. Whitaker, *A History of Ether and Electricity*, vol. 2, p. 180.

[735] "Solar Oblateness and Gravitation," *Gravitation and the Universe*, p. 27. In addition to Eddington's poor photography, his calculation of the deflections is contingent upon determining the star's distance from the limb of the sun. For example, a star which is close to the limb will be deflected about 1.75'', but a star twice the distance from the limb will be deflected half as much. Hence, determining how close a star is to the limb of the sun is absolutely crucial. Obviously, Eddington did not have nearly enough evidence to begin a calculation as sensitive as this one.

Dicke's chart shows six eclipse tests between 1919 and 1952, each with several results. Beginning with the 1919 eclipse, the results are as follows in seconds of arc:

- Trial 1: 1.87-2.12
- Trial 2: 2.00-2.25
- Trial 3: 2.05-2.30
- Trial 4: 1.87-2.05
- Trial 5: 1.27-1.87

Only Trial 5 comes within range of Einstein's 1.75 prediction, and that is only because 1.75 comes between the lower and upper limit of the actual deflections. As Guggenheimer stated in 1925:

> An examination of the various tables of the deflections observed shows that many of them are far away from the quantities predicted. The quantity approximating the predicted one [1.75 sec.] is obtained by averaging a selected few of the observations.

The 1922 eclipse (Australia):

- Trial 1: 1.37-2.17[736]
- Trial 2: 1.62-1.80
- Trial 3: 1.15-2.37
- Trial 4: 1.95-2.35
- Trial 5: 1.62-2.05

The 1929 eclipse (Sumatra):

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[736] It is interesting to note that supporters of General Relativity will record the results of these eclipse photographs in such a way as to make them appear to be very close to Einstein's prediction of 1.75''. For example, in Trial 1 from Australia, the data shows a range from 1.37'' to 2.17'', which means that there were many data points, some above and some below the median line. But when the same event is recorded in Relativity textbooks the figure given is 1.77'' ± 0.40'', since 1.77 is between 1.37 and 2.17. In other words, there may have been no results showing a 1.77'' deflection, but the author merely took the average of the high (2.17'') and low (1.37'') data and recorded it as 1.77'', since that figure is close to Einstein's prediction of 1.75''. In addition, the reader is expected to assume that the ± 0.40'' margin of error has no effect on the conclusion.

- Trial 1: 1.62-1.87 and 2.12-2.37
- Trial 2: 1.80-2.20
- Trial 3: 1.85-2.05

The 1936 eclipse (One in USSR and two in Japan):

- Trial 1: 2.40-2.95
- Trial 2: 2.30-3.10
- Trial 3: 1.25-2.30

The 1947 eclipse (Brazil):

- Trial 1: 1.70-2.25
- Trial 2: 1.85-2.60

The 1952 eclipse (Sudan):

- Trial 1: 1.60-1.80
- Trial 2: 1.20-1.50

Misner, Thorne and Wheeler quote Dicke's results as follows:

> The analyses [of the experimental data] scatter from a deflection at the limb of the sun of 1.43 seconds of arc to 2.7 seconds [compared to a general relativistic value of 1.75 seconds]. The scatter would not be too bad if one could believe that the technique was free of systematic errors. It appears that one must consider this observation uncertain to at least 10 percent, and perhaps as much as 20 percent." This result corresponds to an uncertainty in γ of 20 to 40 percent.[737]

In brief, no one has obtained 1.75, not even Arthur Eddington. As we will discover in the precession of Mercury, however, for a given radius of the star from the sun (*viz.*, 6.956×10^{10} cm), General Relativity is locked into one precise numerical value, 1.75 seconds of arc. If it is higher or lower, General Relativity is disqualified. In 1960, H. Von Klüber had already outlined why such tests were futile for Relativity. Among the difficulties are the refraction of light in the sun's corona; distortions in the optics caused by temperature changes during the eclipse; changes in scale between the eclipse and the control photographs; distortions in photographic emulsion while drying; and errors in measuring the images on the photographs.[738] By a series of graphs showing plots of the eclipse data, von Klüber shows how tenuous Eddington's claims really are.

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[737] *Gravitation*, p. 1104.

For example, in the 1936 Sternberg graph it shows eleven star rays bent away from the sun and fifteen towards it, thus revealing 42% of the deflections were in the opposite direction of Einstein's prediction. In addition, the three points on the upper left show a much sharper upturn to the deflection pattern than what is represented by the dotted line. Similarly, in the 1936 Sendai graph, there are no points of less than four solar radii that would justify drawing the hyperbola with a sharp upward slope. Other eclipse results show the same problems. In the 1947 Yerkes I graph, nineteen light rays are bent away from the sun and twenty-eight toward, showing the same ~ 41% deviating from Einstein's prediction. In addition, the hyperbola of the graph is deceptive, since there are in reality only fourteen points above the line and twenty-four below, and thus it is not representative of the mean curve.

Undaunted, modern scientists were still determined to "prove" Relativity. Another eclipse test was performed in 1973 but with even more dismal results. In this graph, the General Relativity prediction represented by the sharp rise in the hyperbola is hardly justifiable, since the two shaded points indicate the largest errors on the graph. On a statistical basis, a straight line intersecting the sun's limb at ~ .7 arc seconds is more likely.[739]

We should not be surprised at these inaccuracies. As Alan MacRobert, senior editor of *Sky and Telescope*, notes:

> Rare is the night (at most sites) when any telescope, no matter how large its aperture or perfect its optics, can resolve details finer than 1 second of arc. More typical at ordinary locations is 2 or 3 arc-second seeing, or worse.[740]

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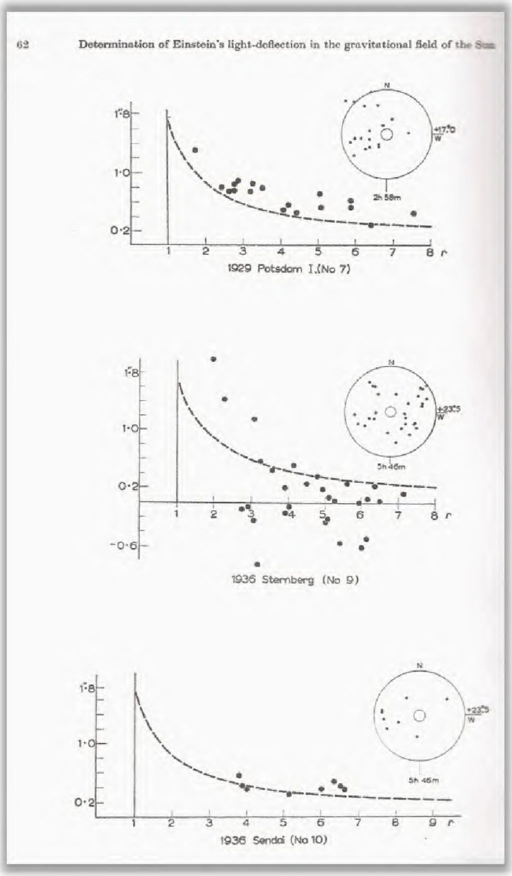
[738] "The Determination of Einstein's Light-Deflection in the Gravitational Field of the Sun," *Vistas in Astronomy*, Pergamon Press, London, 3:47-77, 1960.

[739] Graph taken from J. B. Zirker, *Total Eclipse of the Sun*, 1995, p. 179. As Zirker notes: "As you can see, the scatter is fairly large at large distances, and the position of the curce depends strongly on one or two point close to the sun" (*ibid.*, p. 178).

[740] "Beating the Seeing," *Sky and Telescope*, 89, 4, pp. 40-43, 1995.

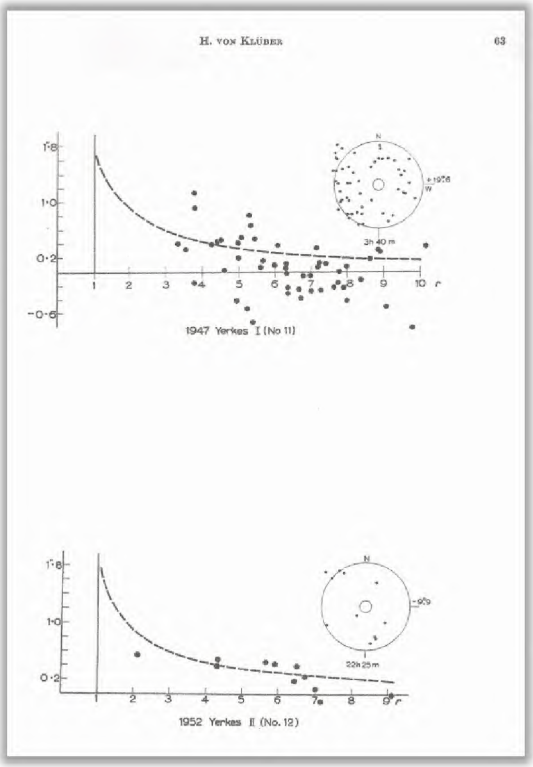


62 **Determination of Einstein's light-deflection in the gravitational field of the Sun**

1929 Potsdam I.(No 7)

1936 Sternberg (No 9)

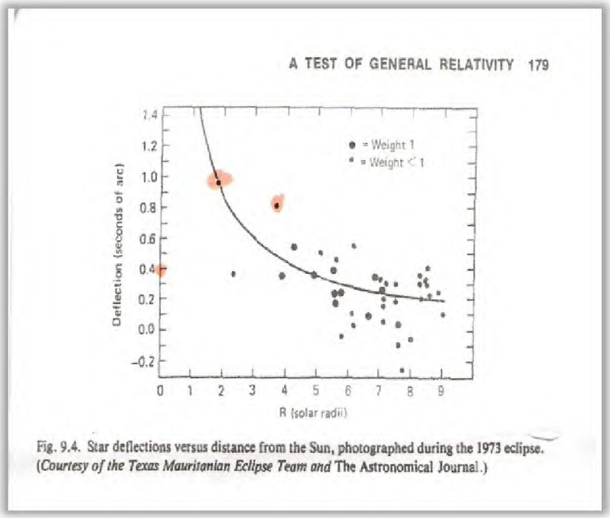
1936 Sendai (No 10)



H. von Klüber 63

1947 Yerkes I (No 11)

1952 Yerkes II (No. 12)



A TEST OF GENERAL RELATIVITY 179

Fig. 9.4. Star deflections versus distance from the Sun, photographed during the 1973 eclipse. (*Courtesy of the Texas Mauritanian Eclipse Team and* The Astronomical Journal.)

While the eclipse experiments were fading, Relativists then began a series of experiments using light from quasars and radio waves near the sun. But again, "the primary factor limiting the accuracy was the solar corona, the hot, turbulent gas of ionized hydrogen at 2 million degrees that extends out to several solar radii from the sun."[741] Regarding the sun's corona, other physicists address the additional claim by Relativists concerning the Viking space probe. In words that disclose the evidential poverty of General Relativity to explain the results, Marmet and Couture conclude:

> …all the experiments claiming the deflection of light and radio waves by the sun are subjected to very large systematic errors, which render the results highly unreliable and apparently incorrect…. There is a desperate situation among scientists for not being able to show, with the most sophisticated technology, what is considered to be the basic principle of general relativity on which rely most of modern science, while this was claimed to be demonstrated by Eddington in 1919 using a simple four inch amateur size telescope."[742]

Added to this is the fact that even if General Relativity comes close to the proper value of light deflection near the sun, still, other physicists claim that the same phenomenon can be explained just as easily from the Newtonian perspective, and thus leaves General Relativity without one of its most famous proofs. As physicist Stan Gibilisco puts it:

> The amount of change in the positions of stars near the sun was very close to the function predicted by the general theory of relativity. Scientists who supported this theory considered the experiment a great triumph. But other evidence had to be found to provide more conclusive proof of the theory. Newton's theory also would predict the same effect, and while the deviation in stellar positions predicted by Newton was only half the observed

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[741] *Was Einstein Right*? p. 85.

[742] Paul Marmet and Christine Couture, "Relativistic Deflections of Light Near the Sun Using Radio Signals and Visible Light," *Physics Essays*, 12, 1, pp. 162-173, 1999. http://itis.volta.alessandria.it/episteme/marm1. html or see http://www. newtonphysics .on.ca/Eclipse/Eclipse .html. Also see: "The Deflection of Light by the Sun's Gravitational Field" by Paul Marmet for one of the better critiques. http://www.newtonphysics.on.ca/Einstein/App endix2 .html.

> amount, and only half the amount predicted by general relativity, the error could be traced to a simple miscalculation by Newton concerning the intensity of the sun's gravitational field. Some effect had to be observed that would agree with the general theory of relativity, but was entirely neglected by the physics of Newton. The orbit of the planet Mercury proved to be the answer to this search.[743]

The Strange "2" Factor

Suffice it to say, Mercury's perihelion does not offer any proof for General Relativity, as we will discover in the next Appendix. Be that as it may, the history of the analysis of light deflection near the sun is by far one of the more confusing assortment of claims and counter-claims that have filled the landscape of theoretical physics. The story starts in 1801 with Johann von Soldner's attempt at calculating the deflection of starlight near the sun.[744] Based on the corpuscular theory of light, Soldner understood light to have mass, and mass is subject to Newton's law of gravitation. But this is where the confusion starts. In 1923, Robert Trumpler notes the following:

> In setting up the differential equations for the motion of the particle he erroneously used for the gravitational force the expression
>
> $$2gr^{-2}$$

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[743] Stan Gibilisco, "Understanding Einstein's Theories of Relativity," 1983, p. 146. Peter Rowlands says much the same: "In fact, all the standard experimental results which are used as tests of the general theory can be derived by using nothing more complicated than Newtonian gravity and special relativity" ("A simple approach to the experimental consequences of general relativity," *Space Physics*, June 13, 1996, p. 50). L. I. Schiff adds: "Since the first two of the three 'crucial tests' can be derived from the equivalence principle and special relativity without reference to the geodesic equation or the field equations of general relativity, it follows that only the orbit precession really provides a test of general relativity" ("On Experimental Tests of the General Theory of Relativity," Institute of Theoretical Physics, Standford University, October 6, 1959, p. 343).

[744] *Astronomisches Jahrbuch für das Jahr*, C. F. E. Späthen, Berlin, 1801, pp. 161-172, translation provided by Stanley Jaki in *Foundations of Physics*, Vol. 8, Nos. 11/12, 1978, pp. 939-950.

The factor 2 has no justification and should be omitted. Designating by ω the angular deflection of light from a star at infinity until it reaches the surface of the attracting body Soldner derived the formula

$$\alpha = tang\ \omega = \frac{2g}{v\sqrt{v-4g}}$$

where v = speed of light

which he applied to the earth and the sun. On account of the mistake mentioned his result for the sun (half deflection) ω = 0".84 is twice too large. Correcting Soldner's formula and using modern constants a ray of light just grazing the sun's surface is deviated from infinity to infinity by the angle α = 0".87 if the corpuscular theory of light and Newton's law of gravitation are adopted.[745]

H. von Klüber reiterates Trumpler's words in his 1960 paper:

Soldner (1801) investigated the behavior of a light-ray in a gravitational field of the classical Newtonian type, assuming the corpuscular theory. Unfortunately, his formula contains the erroneous factor 2. Correcting for this, and using modern constants, it can be shown that light coming from a star, and just grazing the limb of the sun before reaching an observer on the Earth, should be deviated by an angle of 0".87.[746]

In his original 1801 paper, Soldner seems to defend the two-factor:

If one were to investigate by means of the given formula how much the moon would deviate a light ray when it goes by the moon and comes to earth, then one must, after substituting the corresponding magnitudes and taking the radius of the moon for unity, double the value found through the formula, because a

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[745] "Historical Note on the Problem of Light Deflection in the Sun's Gravitational Field," *Science*, August 31, 1923, pp. 161-162.

[746] "The Determination of Einstein's Light-Deflection in the Gravitational Field of the Sun," p. 47.

> light ray, which goes by the moon and comes to the earth describes two arms of a hyperbola.[747]

Soldner's reasoning is true even in General Relativity, since the angle of deflection should be the difference in the direction of the two asymptotes. Hence, Soldner's results could be interpreted such that ω = 0".87 is half of the deflection caused by the sun, and thus a full deflection would amount to 1".74. Or if we use Soldner's original figure of ω = 0".84, it is about half of 1".70.[748]

Interestingly enough, in 1911 Einstein published an article in *Annalen der Physik*[749] based on an entirely different approach than Soldner's, which included the idea that the speed of light changes near the sun due to varying strengths of gravity depending on where the light is passing. Using the Huygens principle of a light ray's path, Einstein used the equation:

$$\alpha = 1/c^2 \int_{\theta=\,-1/2\pi}^{\theta=1/2\pi} \frac{kM}{r^2} \cos\theta \, ds$$

$$= \ \alpha = 2\mathrm{kM}/c^2\Delta$$

where

k = constant of gravitation
M = mass of attracting body
Δ = distance of light ray from attracting body
c = speed of light

In this equation Einstein obtains $\alpha = 4 \times 10^{-6}$ or 0".83 seconds of arc, but, like Soldner's, can be also adjusted to 0".87 based on a more accurate mass for the sun. In remarking on this value, Einstein wrote to Erwin Freundlich in 1913:

> That the idea of a bending of light rays was bound to emerge at the time of the emission theory is quite natural, as is the fact that

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[747] Jaki's translation in *Foundations of Physics*, *op cit*., p. 947.

[748] Richard de Villamil, in a letter to Arvid Reuterdahl, argues that Soldner made the simple mistake of not differentiating the original equation properly (August 24, 1925/1926, Department of Special Collections, O'Shaughnessy-Frey Library, University of St. Thomas, MN, pp. 2-3, letter on file).

[749] *Annalen der Physik*, 35, 898, 1911.

> the numerical result is exactly the same as that according to the equivalence hypothesis.[750]

The first question that arises here is one of priority. Since Soldner was the first to calculate how light would bend around the sun, it requires a citation to Soldner's work, but no such reference appears in the 1911 *Annalen* article. This is similar to the same failure Einstein demonstrated when he did not give any credit in his 1905 paper to the work of Henrick Lorentz or Henri Poincaré in the area of Relativity theory. Other scientists were well aware of Soldner's work. For example, Franz Johann Müller wrote a paper on Soldner's work in 1914.[751] Arthur Eddington, gravity in an article in the *London Times* of 1919, even recognized Newton's priority regarding at least the query of how light would behave around the sun.[752]

The second question concerns why Einstein's prediction of "0.83, which is based on the "equivalence" principle of Relativity theory, is identical to Soldner's value. If Einstein had access to Soldner's "0.84 when he wrote his 1911 paper (and not noticed Soldner's "two-factor" error), it seems he would have done whatever he could to make an "equivalence" calculation commensurate with "0.84. He could do this by matching the initial integral equation, which results in: $\alpha = 2kM/c^2\Delta$, to Soldner's algebraic expression $\alpha = 2g/v\sqrt{v - 4g}$

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[750] *The Collected Papers of Albert Einstein*, Volume 5, Document 468, Princeton University Press, 1995, p. 351, cited in C. J. Bjerknes' *The Manufacture and Sale of St. Einstein*, p. 2141.

[751] F. J. Müller, *Johann Georg von Soldner*, Geodät, Kastner and Callwey, München, 1914. Yet in defense of Einstein, Abraham Pais says: "In 1911 Einstein did not know of Soldner's work. The latter's paper was in fact entirely unknown in the physics community until 1921," although Pais admits that "Soldner, who in 1801 became the first to answer Newton's query on the bending of light" (*Subtle is the Lord*, p. 200). Von Klüber says only that Einstein "probably" didn't know anything of Soldner's work (*op. cit.*, p. 47).

[752] The article was titled: "Einstein's Theory of Space and Time," and stated: "The deflection of the star images means a bending of the ray of light as it passes near the sun, just as though the light had weight which caused it to drop towards the sun. But it is not the bending of light that threatens the downfall of Newton. On the contrary, were Newton alive he would be congratulating himself on his foresight. In his 'Optiks' we read: -- 'Query 1. Do not bodies act upon light at a distance, and by their action bend its rays, and is not this action strongest at the least distance?' Weight of light seemed less strange to Newton than to us, because he believed light to consist of minute corpuscles, whereas for us the bending of a wave of light is a much more difficult conception."

In his 1915 paper, however, Einstein would change this equation so that it doubled the 0.83 value to 1.7. But by now, those who cared to study the issue probably knew that Soldner had only calculated half the deflection, and that a full deflection would equal 1.7. Nevertheless, Robert Trumpler defended Einstein's doubling of the value by saying:

> The increase of this value over that in Einstein's 1911 paper is not due to any mistake in calculation in the earlier paper but is an effect of the difference between Einstein's and Newton's law of gravitation, as the 1916 deflection is essentially based on the principles: (1) Light is subject to gravitation. (2) Gravitation follows Einstein's law instead of Newton's.[753]

But Einstein's sudden doubling of the light-bending angle did not escape the scrutiny of other physicists. Arvid Reuterdahl remarked:

> In *Science* (August 31, 1923), Dr. Robert Trumpler calls attention to the error in Soldner's work. Note that it is Soldner that is wrong despite the fact that Einstein's 1911 formula is identical with that of Soldner. It is also curious that when Einstein tried again in 1916 to produce a formula it did not agree with his first effort, in fact, the 1916 formula gives a value twice as large as the one in 1911. Both are right according to the Einsteinians: – two equals one.[754]

Subsequent studies on this problem are confusing, at best. In 1959, L. I. Schiff accounted for Einstein's doubling of the angle by saying that the 1911 value was based only on time dilation whereas the 1916 value was based on both time dilation and length contraction.[755] As such, he also claimed that the angle for the bending of light is derivable from the equivalence principle as opposed to the field equations from General Relativity. In 1968, Sacks and Ball criticized the solution because Schiff used the equivalence postulate improperly by extending it to include the Lorentz contraction. In the same year, Tangherlini derived the 1916 value by adding the 1911 Einstein deflection to the Soldner deflection.[756] In 1978, Comer and Lathrop also dismissed Schiff's attempt by saying he incorrectly used the local equivalence principle, which they replaced with a combination of the equivalence principle and infinitely fast particles in a geodesic, requiring the full use of the field equations of General Relativity.[757] In 1984, M. Strandberg asserted that Special Relativity and the local equivalence principle are the only equations needed to get the 1916 value since the former has "unexploited" properties that allow it to predict global effects that were once thought to be the sole domain of General Relativity.[758] In 1989, Tian and Li claimed to have found the rest mass of a photon and thus derive its speed and deflection in a gravitational field.[759] In 1966, P. Rowlands posited that Newtonian physics combined with Special Relativity could explain the light deflection and thus produce the 1916 value.[760]

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[753] "Historical Note on the Problem of Light Deflection in the Sun's Gravitational Field," *Science*, August 31, 1923, p. 162.

[754] A. Reuterdahl, "The Einstein Film and the Debacle of Einsteinism," *The Dearborn Independent*, March 22, 1924, p. 15, cited in Bjerknes, pp. 2144-45. Bjerknes says Reuterdahl is relying on Philipp Lenard's "confusing analysis" of Soldner's paper and concludes: "Reuterdahl…mistakenly believed that Soldner's result matched Einstein's 1911 prediction, when in fact it comes closer to Einstein's revised 1915 prediction. (Abraham Pais [Subtle is the Lord, pp. 199-200] and many others have made the same mistake Reuterdahl made" (*The Manufacture of St. Einstein*, p. 2145).

[755] L. I. Schiff, "On Experimental Tests of the General Theory of Relativity, Standford University, October 1959, pp. 340-343.

A less confusing attempt at accounting for the doubling of Einstein's light-bending value is that offered by Misner, Thorne and Wheeler, at least from the perspective of General Relativity. These authors offer two distinct views of the situation: (a) the linear view that analyzes light bending from the sun to the outskirts of the solar system, and (b) the post-post-Newtonian (PPN) view from the sun to earth. The latter case is relevant to this discussion because it may explain the "2" factor. In this scenario, the authors show that the Earth observer intercepts the light deflection half-way through its course, the total course not being accomplished until well outside the gravitational potential, *i.e.*, outside the solar system.[761] The equation for finding…..

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[756] As noted in M. W. P. Strandberg's "Special relativity completed: The source of some 2s in the magnitude of physical phenomena," Massachusetts Institute of Technology, March 29, 1985, p. 323.

[757] Robert P. Comer and John D. Lathrop, "Principle of equivalence and the deflection of light by the sun," Williams College, March 29, 1978.

[758] M. W. P. Strandberg, "Special relativity completed: The source of some 2s in the magnitude of physical phenomena," Massachusetts Institute of Technology, March 29, 1985, pp. 321-327.

[759] Renhe Tian and Zhuhuai Li, "The speed and apparent rest mass of photons in a gravitational field," Beijing Normal University, June 5, 1989, pp. 890-892.

[760] Peter Rowlands, "A simple approach to the experimental consequences of general relativity," *Space Physics*, June 13, 1996, pp. 49-55.

> "the deflection angle measured at the Earth is
>
> $$\delta\alpha = \frac{(1+\gamma)M\odot}{b}(1 + \cos\alpha)$$
>
> which, "ranges from zero when the ray comes in opposite to the sun's direction…to the 'classical value' of ½(1 + γ) × 1".75 when the ray comes in grazing the sun's limb."[762]

But if that is the case, then the equation Einstein used in 1915 to arrive at "1.7, namely:

$$\alpha = 4kM/c^2r$$

must be adjusted for an Earth observer, and the adjustment results in precisely half of the total deflection, that is, half of 1.7 is ~ 0.84. Of course, this would make the sighting on Earth of anything near the accepted value of 1".75 (including Eddington's) either ficititious or the mere result of an already-programmed doubling adjustment in the calculations. This is why von Klüber can say:

> "…and using modern constants, it can be shown that light coming from a star, and just grazing the limb of the Sun before reaching an observer on the Earth, should be deviated by an angle of 0".87.[763]

It is, perhaps, the same reason that Misner, Thorne and Wheeler can say that the maximum deflection of a light ray from a star that just grazes the sun, as seen by an observer on Earth, will be:

$$\tfrac{1}{2}(1 + \gamma) \times 1''.75$$

wherein the coefficient "½" would be numerically equivalent to a half-deflection. The same authors more or less confirm this reasoning for us since in their linear calculation of the bending of light (a calculation that has the light beam passing the sun and proceeding to beyond the solar system), the final equation is: “For the sun…

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[761] Misner, Thorne and Wheeler, *Gravitation*, pp. 1101-1103.

[762] *Gravitation*, p. 1103.

[763] *Op cit.*, p. 47.

$$\frac{4M}{\ell}$$

> …For light grazing the sun, $\ell = R_\odot$, this gives $\Delta\varphi = 4M_\odot/R_\odot$ radians = 1".75, which is also the prediction of general relativity, and is consistent with the observations.”[764]

So it appears that Soldner’s original value was correct, and that General Relativity confirms this by its own PPN analysis of the situation.

Interestingly enough, the difference in the linear analysis and the PPN analysis of light bending near the sun brings up an interesting anomaly in the theory of General Relativity. As it stands, the theory uses an Earth-based observer for its PPN analysis, but by its own admission the velocity of light on Earth is less than c. According to General Relativity, the true value of c can only be demonstrated outside the solar system where there is no gravitational potential. Consequently, the varying positions throught the year of the sun, the moon and the planets relative to the Earth should cause periodic fluctuations in the velocity of light on Earth. Although these fluctuations would be small, nevertheless, modern instruments boast of knowing the speed of light to at least eight significant figures, if not more. Yet the fact is, no one has shown evidence of these periodic fluctuations; no one seems concerned about not finding them; and the most important fact of all is that General Relativity does not even predict that there will be such fluctuations.

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[764] *Gravitation*, p. 185.

Appendix 6

Does Mercury's Perihelion Prove General Relativity

Einstein also claimed that his prediction of the perihelion of Mercury supported his theory of General Relativity, but this assertion is disproven by the same inaccuracies and biases appearing in the eclipse photographs. By all accounts, determining the complete reasons for the perihelion of Mercury is a formidable task. Based on the gravitational contributions of each of the planets (Pluto excluded), most of Mercury's perihelion is accounted for by Newtonian physics, but a residual remains (about 10% or less).[765] Newtonian physicists tried many and various means to find the reason for the residual, hypothesizing such things as interplanetary movements; the existence of another planet (Vulcan); readjusting the square of the inverse square law to 2.0000001574 instead of 2.0, all with only marginal success. Still today, due mainly to unknown variables in the data, as well as the arbitrary means of interpreting the data, Mercury's residual perihelion remains perplexing. There is at least a four-body calculation (the sun, Venus, Earth, Jupiter) if not a ten-body calculation (the sun, Earth and the eight planets) involved. In Newtonian physics, calculation of gravitational attraction between two bodies is relatively simple, but when three or more bodies are in the mix, Newton's formula is virtually useless. As Poor states: "Under certain special conditions, mathematicians have been able to find an approximate solution of the problem, but even such approximate solution is extremely intricate. No solution of the general problem has been found."[766]

The first attempt to measure Mercury's perihelion was made in 1843 and then again in 1859 by the French mathematician Urbain Leverrier. He began by analyzing records of sixteen of Mercury's transits across the sun dating from 1677 to 1848. Calculating the entry and exit times of Mercury's transit allows a determination of the planet's angular position within one arc second. After taking account of the gravitational attraction of Venus, Earth, and Jupiter, Leverrier had a residual figure of 38'' (arc seconds) per century, but he could not account for the discrepancy only by the perihelion, and thus he began to examine Mercury's eccentricity. He then included 400 meridian transits of Mercury between 1801 and 1842, which he obtained from the Paris Observatory, and upon finding an eccentricity of 22'' he then added the two figures (38'' + 22'') and concluded that the amount of precession was 60'' per century. After preparing his final tables, however, he arbitrarily eliminated the 22'' of eccentricity, leaving 38'' as the final sum.[767]

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[765] Earth and each of the planets cause gravitational perturbations on each other. Additionally, the sun's oblateness will also add to the general perturbation. The contributions to the perturbations on Mercury, amount to the following (as measured in arc seconds per century): Venus: 277.856; Earth: 90.038; Mars: 2.536; Jupiter: 153.584; Saturn: 7.302; Uranus: 0.141; Neptune: 0.042; Sun's oblateness: 0.010 (as measured prior to the 1960s). These figures add up to 531.509 as the total perturbation on Mercury. But since Mercury's precession is 574.10 arc seconds, this leaves 42.591 arc seconds unaccounted for. NB: the perturbations in the geocentric system (whether Ptolemaic or Tychonic) would be precisely the same.

[766] *Gravitation versus Relativity*, p. 123.

In 1895, Simon Newcomb became the next scientist to attempt to find the reason for Mercury's residual perihelion. Working with Leverrier's 38'' figure, Newcomb arbitrarily decided to reduce the eccentricity, which in turn increased the rotation, and he obtained residual figures of between 41'' and 43''. Hence, the 43'' remained in the textbooks (at least up until Einstein), as the residual perihelion of Mercury not accounted for by Newtonian physics.[768] At that time, however, Newcomb suggested that the sun's oblateness might provide the solution to the remaining puzzle. This would be a significant hypothesis, since both Newtonian and Relativistic calculations of perihelion assume a spherically symmetrical sun.

In Einstein's attempt to account for the residual perihelion there has been some suspicion that, knowing the accepted value in advance (43 arc seconds), he juggled his figures to meet those expectations. That Einstein was already aware of the needed figure was made plain in his book on Relativity:

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[767] N. T. Roseveare, *Mercury's Perihelion from Le Verrier to Eintein*, Oxford University Press, 1983; L. V. Morrison, C. G. Ward, "An analysis of the transits of Mercury: 1677-1973," *Notes of the Royal Astronomical Society* 173, 183-206, 1975.

[768] S. Newcomb, "Tables of Mercury," *Astronomical Papers of American Ephemeris Nautical Almanach*, 6, Washington, 1895-1898. The advance of Mercury's perihelion was calculated by Newtonian physics to be 531.509 arc seconds per century. This falls about 43 seconds short of the observed value, which is 574 arc seconds. As it is commonly understood, the total apparent precession of Mercury's perihelion (as observed from the Earth) is 5600"/100years. Of this, 5025" is attributed to the Earth's precession (precession of equinoxes) and 531.509" due to planetary perturbations of Mercury's orbit. This leaves 43"/100 years unexplained.

> In point of fact, astronomers have found that the theory of Newton does not suffice to calculate the observed motion of Mercury with an exactness corresponding to that of the delicacy of observation attainable at the present time. After taking account of all the disturbing influences exerted on Mercury by the remaining planets, it was found (Leverrier: 1859; and Newcomb: 1895) that an unexplained perihelial movement of the orbit of Mercury remained over, the amount of which does not differ sensibly from the above mentioned +43 seconds of arc per century. The uncertainty of the empirical result amounts to only a few seconds.[769]

The original Einstein-Grossmann theory accounted for only 18'' of the residual 43'' of Mercury's perihelion, which is documented in the original Einstein-Besso manuscripts made public in 1914 by Dutch physicist Johannes Droste. Einstein subsequently retracted the paper, changed his Relativistic field equations no less than three times, and resubmitted them three times, respectively, to the Berlin Academy before the final result of 43'' was achieved.[770] Still, Charles Lane Poor adds that in arriving at the 43'' Einstein did not use the unit of time required by Relativity theory; rather, he used the commonly accepted Newtonian unit of time. Poor also adds that Einstein insisted "in clear unequivocal language" in the Preface of the book that, of all the planets, only Mercury presented anomalous data.[771] Yet Newcomb's 1894-1895 data of 60,000 observations records discordances in the motions of other planets, totaling eleven in all, and four of which he considers highly significant. Thus Poor concludes: "Can it be possible that he [Einstein] has never read the very papers upon which the astronomical proof of the Relativity Theory is supposed to be based?"[772]

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[769] Albert Einstein, *Relativity: The Special and General Theory*, Appendix III.

[770] Michel Janssen, "The Einstein-Besso Manuscript: A Glimpse Behind the Curtain of the Wizard," Fall 2002, p. 12-15, and "What Did Einstein Know and When Did He Know It? A Besso Memo Dated August 1913."

[771] Einstein writes in the Preface: "The sole exception is Mercury, the planet which lies nearest the sun. That for all the planets, with the exception of Mercury, this rotation is too small to be detected…" In a July 30, 1921 letter Einstein writes: "The perihelial movement of Mercury is the only anomalous one in our planetary system which has been sufficiently attested" (*Gravitation versus Relativity*, pp. 185-186).

[772] *Gravitation versus Relativity*, p. 187.

Physicist Tom Van Flandern studied Einstein’s calculations and found there were “three separate contributions to the perihelion; two of which add, and one of which cancels part of the other two; and you wind up with the right multiplier.” The same article reports that Van Flandern approached a University of Maryland colleague who had known Einstein in their respective work at Princeton’s Institute for Advanced Study regarding how, in his opinion, Einstein had arrived at the accepted figure of 43 arc seconds. The colleague replied that it was his impression that “knowing the answer, he jiggered the arguments until they came out with the right value.”[773] Poor says much the same, but points out an added twist in Einstein’s deception:

> Yet this coincidence of figures is largely due to the astuteness of Einstein in quoting the result of Newcomb’s preliminary investigation, and in ignoring the classic work of Leverrier and the final results of Newcomb. According to Einstein the results of the astronomical investigations into the motions of Mercury are summed up as: “it was found (Leverrier – 1859 – and Newcomb – 1895) that an unexplained perihelial movement of the orbit of Mercury remained over, the amount of which does not differ sensibly from the above mentioned +43 seconds of arc per century. The uncertainty of the empirical result amounts to a few seconds only.” Leverrier in 1859 found 38’’: Newcomb in 1895 found 41.6’’; quantities quite different from the 43’’ quoted by Einstein…The coincidence of figures, the supposed agreement between observation and the relativity theory, vanishes the moment the real facts are stated.[774]

The problem for Einstein is, once he chooses 43’’ as the final figure, it cannot be changed in the future, since the equations he formulated from the General Relativity theory will not allow him to do so. Thus, if the real figure turns out to be anything more or less than 43’’, Relativity is automatically disqualified as providing an explanation to Mercury’s perihelion. As Relativist Clifford Will admits: “…the prediction of general relativity is fixed at 43 arcseconds; it can’t be fiddled with.”[775] Poor adds: “There is no flexibility in the Einstein formulas, no constant of uncertain value, no possibility of adjustment."[776] Being caught in such a corner, Relativists will create quite a fuss over anyone who claims to have an alternate figure, as we shall see below.

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[773] Physicist Tom Van Flandern. Article written by Tom Bethel, “Rethinking Relativity,” *The American Spectator*, April 1999.

[774] *Gravitation versus Relativity*, p. 187.

[775] *Was Einstein Right*?, p. 101.

It is worthy of note that already in 1898 Paul Gerber had produced the equation that accounted for the precession of Mercury without any use of Relativistic tensor equations, since they would not be available until 1916. Gerber did, however, use one of the assumptions of Einstein's General Relativity, that is, gravity traveled at the speed of light. Gerber published his finding in Mach's *Science of Mechanics*. It wasn't until Einstein published the same equation in *Annalen der Physik* 18 years later that the editors of *Annalen* reprinted Gerber's equation, pointing out that Einstein should have given credit to Gerber. Although he was an avid reader of Mach's writings, Einstein claimed ignorance of Gerber's previous work (the same reason he gave when it was discovered that his Relativity equation was identical to Lorentz's Transformation equation produced 10 years earlier).

Subsequent calculations of Mercury's perihelion were made after Einstein supported the 43'' figure. In 1930, the figure was raised to 50.9.[777] Just prior to the 1960s, it was set back at 32.0. These wide-ranging values are due to the procedural difficulties stemming from having to account for all the mass and movements in the solar system. In reality, depending on how one views or juggles the figures, one can make the residual perihelion vary quite extensively. Charles Lane Poor shows, for example, that the original calculations by Leverrier had the perihelion of Mercury literally dancing in the sky. He writes:

> The extreme complexity of the problem may be best illustrated by giving the actual expression for the position of the perihelion of Mercury, as affected by the action of Venus alone. This is taken from the work of Leverrier…These show that from February 25 to July 19 the perihelion was moving backward, while during the next period it was moving forward, but on December 10th it was still behind where it had been earlier in the year. All this is complicated enough, but it only accounts for the action of Venus; it requires twenty-one similar terms to account for the action of the Earth, sixteen for Jupiter, six for Saturn, and one for Uranus.[778]

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[776] *Gravitation versus Relativity*, p. 187.

[777] H. R. Morgan, *Journal of the Optical Society of America*, 20, 225, April 1930.

[778] *Gravitation versus Relativity*, p. 143.

By the 1960s, the figure was put at 39.6. Astronomer Robert Dicke (an important person in his own right since his work superseded the crucial experiments of Roland von Eötvös) proposed, after his intensive study, that the oblateness of the sun was responsible for a significant portion of the residual perihelion of Mercury. Dicke and his partner Goldenberg found that the sun's polar axis is shorter than its equatorial axis by approximately 40 parts per million, thus making the sun oblate, and accounting for at least 3.4'' of Mercury's residual perihelion.[779] This new evidence brought the residual down from 43.0 to 39.6, thus making Einstein's attempt at securing 43'' through General Relativity somewhat dubious. Moreover, Dicke's adjustment of 3.4 arc seconds could just as easily been used to offset the 50.9 or the 32.0 figures, thus making them 47.5 and 28.6, respectively.

Robert Clark describes the outcome of Dicke's work: "Dicke began a series of experiments in the mid-1960's whose results brought a headline in *Nature* of 'Einstein in Crisis?'"[780] *Nature* followed in the article stating:

> In spite of the great aesthetic and philosophical appeal of Einstein's general theory of relativity, it is still, after 50 years of widespread acceptance, one of the least well-founded theories in physics as far as experimental confirmation is concerned.[781]

Some astronomers, lending their support to Relativity, doubted Dicke's findings, arguing that the sun's oblateness could not account for such a large portion of the residual perihelion. Suffice it to say, the war was now in full swing. Dicke was definitely a threat to Relativity, since a deviation as large as 3.4'' would immediately topple General Relativity. In 1974, Dicke published a complete reanalysis of the data, and came up with the same result.

Afterward, Dicke and several other astronomers found that in addition to the oblateness, the sun's gravitational quadrupole moment, its rapid internal rotation, and its oscillations in diameter and rate of rotation, all play a part in determining the residual figure of 39.6 arc seconds. If the sun's inner core rotates faster than its exterior, this will cause a precession of the orbits of the planets and explain a significant portion of the residual perihelion. Dicke postulated that the interior core of the sun, at least out to one half its radius, rotates twenty times faster than the exterior. Ian Roxburgh was one of the first to make this evidence public. His abstract reads:

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[779] "Solar Oblateness and Gravitation," *Gravitation and the Universe*, pp. 30f. In a report dated January 13, 1967, to the American Physical Society, Dicke and Goldenberg report: "New measurements of the solar oblateness have given a value for the fractional difference of equatorial and polar radii of $(5.0 \pm 0.7) \times 10^{-5}$. A corresponding discrepancy of 8% of the Einstein value for the perihelion motion of Mercury is implied" (*Physical Review Letters*, 18, 313). NB: 8% of 43.0 is 3.4.

[780] *Nature* 202, 1964, pp. 432f.

[781] *Einstein: The Life and Times*, p. 767.

> The hypothesis that the inside of the Sun is rotating much more rapidly than the surface layers…The angular velocity of the inner region is estimated and it is shown that the rotational distortion of the Sun produces a perihelion advance of the planets. If the angular velocity inside the Sun has the same magnitude as in a typical rapidly rotating star, then the anomalous advance of the perihelion of Mercury, usually counted as one of the crucial tests of general relativity, can be explained by the gravitational effect of the rotating Sun.[782]

Subsequent experiments performed in 1973-1982 by Henry Hill gave results that were five times smaller than Dicke's but still fifty-times larger than the conventional value. Dicke came back in 1985 with further experiments and stated that the results yielded 12 parts per million rather than the original 40 parts per million.[783] These results show the extreme difficulty in obtaining accurate and reliable results. As Relativity supporter Clifford Will admits: "It is ironic that after seventy years, Einstein's first great success remains an open question, a source of controversy and debate."[784]

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[782] Ian W. Roxburgh, "Solar Rotation and the Perihelion Advance of the Planets," *Icarus*, 3:92, 1964.

[783] R. H. Dicke, J. R. Kuhn, K. G. Libbrecht, "The variable oblateness of the Sun: measurements of 1984," *Astrophysical Journal*, 311, 1025-1030 (1986); R. H. Dicke, J. R. Kuhn, K. G. Libbrecht, "Is the solar oblateness variable? Measurements of 1985," *Astrophysical Journal*, 318, 451-458, 1987; J. R. Kuhn, K. G. Libbrecht, "Oblateness of the Sun in 1983 and Relativity," *Nature*, 316, 687-690, 1985; L. Campbell, J. C. Mc Dow, J. W. Moffat, D. Vincent, "The Sun's Quadrupole Moment and Perihelion Precession of Mercury," *Nature* 305:508, 1983; Anna Maria Nobili and Clifford M. Will, "The Real Value of Mercury's Perihelion Advance," *Nature* 320, 39-41, 1986; D. O. Gough, "Internal rotation and gravitational quadrupole moment of the Sun," *Nature*, 298, 334-339, 1982; S. Pireaux, J. P. Rozelot, S. Godier, "Solar quadrupole moment and purely relativistic gravitation contributions to Mercury's perihelion Advance," *Astrophysics and Space Science* 284, 1159-1194, 2003; M. Bursa, "The Sun's flattening and its influence on planetary orbits," *Bulletin of the Astronomical Institute Cze.*, 37, 5, 312-313, 1986; J. V. Narlikar, N. C. Rana, "Newtonian N-body calculations of the advance of Mercury's perihelion," *Notes of the Royal*

In the face of the foregoing evidence, there has been an inordinate amount of pressure put on the scientific community not only to maintain a residual perihelion for Mercury of 43 arc-seconds, but to attribute it solely to General Relativity and to minimize any findings from the sun's inherent characteristics that provide an alternative answer.

In the face of these difficulties, some have suggested using the perihelia of Venus, Earth or Mars to help prove Relativity theory. But this presents an even worse dilemma for Relativity, considering the anomalous results of Einstein's predictions for the perihelia of the other planets. Indeed, it is puzzling why Relativists would want to open this Pandora's Box at all. Perhaps they are hoping that no one will investigate the original records of Relativity's predictions, but, unbeknownst to most, the investigation has already been done. A person close to the scene and one who obtained General Relativity's original perihelia predictions was celestial mechanic Charles Lane Poor of Columbia University. Poor first reveals Einstein's admission: "The only secular perturbation is a motion of the perihelion."[785] Poor interprets this statement as follows:

> Thus the relativity theory cannot explain, or account for, any of the observed discrepancies in the motions of the planets, other than those in the perihelia. But it is clear that, under the Relativity theory, the perihelia of all the planets must rotate by various amounts depending upon their respective distances from the sun. The amounts of such rotations can be readily calculated from the formula given by Einstein for the case of Mercury.

Astronomical Society 213, 657-663, 1985; Ronald L. Gilliland, "Solar Radius Variations over the Past 265 Years," *Astrophysical Journal* 248:1144, 1981; "The Sun Shivers on a 76 Year Cycle," *New Scientist*, 92:165, 1981; David W. Hughes, "Solar Size Variation," *Nature* 286:439, 1980; David W. Dunham, *et al*, "Observations of a Probable Change in the Solar Radius between 1715 and 1979," *Science* 210:1243, 1980; Leif M. Robinson, "The Disquieting Sun: How Big, How Steady?" *Sky and Telescope*, 63:354, 1982; S. Sofia, "Solar Radius Change between 1925 and 1979," *Nature* 304:522, 1983.

[784] *Was Einstein Right*? p. 107.

[785] As quoted in *On Einstein's Theory of Gravitation and its Astronomical Consequences*, by W. de Sitter, in *Monthly Notices*, Royal Astronomical Society, vol. lxxvi, No. 9, p. 726, as cited in *Gravitation versus Relativity*, p. 190.

Poor then shows that Einstein's results vary widely from those of Newcomb. For example, Relativity would predict a +8.6'' perihelion for Venus, but Newcomb recorded -7.3''. In other words, Relativity would predict a perihelion for Venus that was going in the opposite direction of what was actually observed. As Poor describes it:

> The perihelion of this planet is rotating more slowly than the computations indicate it should, the difference being –7.3'' per century. The Einstein formulas would increase the theoretical speed of rotation by an additional 8.6'', thus making the total discrepancy between observation and theory 15.9 or 37% of the entire observed motion. The Einstein formulas, in this case, make a bad matter worse; they give the orbit a rotation in the direction opposite to that which is required to fit the observations. Thus the Relativity theory is not sufficient to explain the discordances in the planetary motions. It accounts approximately for only one among the numerous discrepancies of the perihelion of Mercury. It fails completely to explain any position of several well-tested irregularities and it doubles the observed discrepancy in the motion of Venus.[786]

Some advocates of Relativity attempt to cover up these inconsistencies, as seen, for example, in Hugh Ross' assertion that General Relativity found a precession for Venus of "8.6," a figure, according to his endnotes, that he obtained from Steven Weinberg's *Gravitation and Cosmology*.[787] Perhaps because they were trying to save face for Relativity theory, neither of the two authors mention the observational figure of –7.3.

Poor also reports that Einstein's Relativity predicted a perihelion for Mars of +1.3'', but the observational figure is +8.1'', a difference of 623%.[788] Not surprisingly, Weinberg and Ross leave out General Relativity's anomalous prediction, replacing it with the precession of the asteroid Icarus.[789] Einstein's formula also makes an erroneous prediction of Earth's perihelion, assigning a figure of +3.8'' when, according to heliocentric mechanics, it is actually 5.9''. Also, Newcomb was able to measure the nodes of Mercury (5.1'') and Venus (10.2'') as well as the eccentricity of Mercury (0.88''), but Einstein's formula simply isn't able to make such calculations with a value greater than zero.

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[786] *Gravitation Versus Relativity*, New York: Putnam and Sons, 1923, p. 194.

[787] *Gravitation and Cosmology*, New York: John Wiley, 1972, p. 198. Ross says that the observed value of Venus' perihelion is "8.4'' ± 4.8" and that General Relativity's prediction was "8.6''."

[788] *Gravitation Versus Relativity*, p. 191. In addition, the observed value of Mercury's nodal precession is +5.1 ± 2.8 and Venus' is +10.2, but Relativity calculated zero for both.

Other anomalies in Relativity's ability to calculate the perihelion of the heavenly bodies crop up from time to time. For example, for the binary DI Herculis, composed of two stars which circle each other in about 10.5 days, General Relativity predicts that the orbit should rotate by 4.27° per century, but the actual value is 1.05°. Many such discrepancies occur in other binary systems.[790] The discrepancies are more frequent when the gravitational field is stronger, as it is in binary systems, yet ironically General Relativity was invented in order to explain the phenomenon of gravity.

Lastly, Poor wrote two devastating critiques of Einstein's use of the perihelion of Mercury to prove Relativity theory. The first was written in 1923 titled "Relativity: An Approximation," presented to the American Astronomical Society; the other in 1924 titled "The Relativity Motion of Mercury: A Mathematical Illusion," presented to the Physics Colloquium of Columbia University. The former is included at the end of this Appendix.

The Brans-Dicke Challenge to Einstein

In the 1960s, one of the premier astronomers of the day, Robert H. Dicke, put forth a challenge to General Relativity based on Mach's principles. Our purpose in revealing the challenge, however, is not to propose that Brans-Dicke offered a viable alternative to General Relativity; rather, it is to show that the new theory forced Relativists to cease basing their theory merely on mathematics and demanded that they provide the world with real physical evidence for their beliefs. For our interests, it matters little which theory eventually wins in the minds of modern scientists. Rather, our interest lies in seeing one form of relativity challenge another form, and in the process, expose both for the erroneous concepts they present.

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[789] *The Fingerprints of God*, p. 46. Icarus, technically known as 1566 Icarus, an asteroid discovered by Walter Baade in 1949, intersects the sun-Earth semi-major axis.

[790] Robert Naeye, "Was Einstein Wrong?" *Astronomy*, 23:54, 1955, as cited in *The Biblical Astronomer*, Vol. 6, No. 77, 1996.

Robert Dicke's first challenge to General Relativity regarded the perihelion of Mercury. Dicke found that, contrary to the theory of General Relativity, part of Mercury's residual perihelion was due to the sun's oblateness as well as its fast rotating inner core. With Carl Brans, Dicke put forth another challenge, much more formidable. Based on Mach's principles, they offered a theory of gravity which was opposed to the one established by General Relativity.[791] They posited that the gravitational force between two bodies should be determined not only by the two bodies themselves, but also by the distant matter in the universe (*e.g.*, stars, galaxies, etc.).[792] In effect, as Brans writes, they were proposing "to find a physical basis for inertial reaction forces,"[793] a force of nature that had eluded a convincing explanation from the time of Aristotle, through Newton and down to Einstein. Dennis Sciama had also suggested the same in 1953.[794] To the consternation of General Relativity advocates, the Brans-Dicke theory has a built-in mathematical variable that will not allow the theory to be disproved.[795] As Clifford Will describes:

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[791] C. Brans and R. H. Dicke, "Mach's principle and a relativistic theory of gravitation." *Physical Review* 124 (1961): 925-35. SCI reported that Brans and Dicke's article was cited in over 565 publications between 1961 and 1983. See also R. H. Dicke, "Dirac's cosmology and Mach's principle," *Nature* 192 (1961): 440-41.

[792] Dicke wrote in his autobiography: "…the laboratory, Earth and Solar System could not be isolated even in principle from the rest of the universe" (*R. H. Dicke, A scientific autobiography*, unpublished manuscript on file in the Membership Office of the National Academy of Sciences, 1975). Dicke proposed considering the gravitational constant, *G*, as the ratio of gravitational to inertial mass. As Brans put it: "Any influence of the universe structure on inertial forces would then show up in terms of *G*, expressed in 'standard' units for which inertial mass is defined as constant. This also was consistent with Dirac's conjecture $1/G \sim M/R$." To calculate the gravitational effect of the universe on two bodies, one would need to determine the radius of the universe, multiply the radius by the square of the speed of light, and then divide the result by the mass of the universe, and then multiply by the volume of a sphere. The resulting number should equal the gravitational constant, *G*, which is 0.0000000667 $\text{cm}^3/\text{grams}/\text{second}^2$. Dicke came within a factor of 100 using a 10 billion light-year radius and 200 grams per cubic million kilometers. Of course, if Dicke's radius is decreased and the grams/million kilometers^3 increased in line with the parameters of a smaller yet denser geocentric universe, the resulting factor would be a lot closer to the gravitational constant. For example, attaining *G* for a 90 parsec radius universe, the mass of the universe is 1.31×10^{61} grams.

[793] Carl H. Brans, "Citation Classic," in *Current Contents*, March 7, 1983, p. 24.

> …the scalar-tensor theory was every bit as valid mathematically as general relativity, and was capable of making detailed predictions for the outcomes of experiments…the theory could do anything general relativity could do.[796]

Although various experiments were performed to distinguish between General Relativity and Brans-Dicke, the precision needed to do so was so high that it simply was not feasible. As Clifford Will puts it:

> The problem of Mercury's perihelion shift and the solar oblateness remained unresolved; if anything it was now even more contentious, because the prediction of the Brans-Dicke theory with ω larger than 500 for Mercury's perihelion shift is indistinguishable from that of general relativity, so if the solar oblateness were to be as large as the original Dicke-Goldenberg 1966 value, both theories [General Relativity and Brans-Dicke] would be in violation of experiment. Could one say that the scalar-tensor theory was completely dead? Not exactly. Because

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[794] Dennis W. Sciama, "On the Origin of Inertia," *Monthly Notices of the Royal Astronomical Society*, 113:34-42, 1953; and *The Unity of the Universe*, New York, Doubleday, 1961.

[795] As Brans put it: "I started from this point, looking for field equations which would contain 1/*G* as a field quantity, and having mass as a source. A simple division of the Einstein Lagrangian by *G*, to isolate it from the matter Lagrangian, so that matter will be conserved as usual, came to mind quickly as a starting point. An extra term, involving φ and its derivatives, must then be added with its form determined by dimensional arguments. However, its numerical coefficient could not be determined and was left as a free dimensionless constant. Standard Einstein theory is recovered in the limit as this constant, ω, approaches ∞. Thus, in principle, with no independent guide to the value of ω, no experiment with finite error can rule out the scalar-tensor theory in favor of Einstein's" (Carl Brans, "Citation Classic," in *Current Contents*, March 7, 1983, p. 24).

[796] Clifford Will, *Was Einstein Right*?, p. 154. Will relates that "…the joke that used to go around Kip Thorne's relativity research group at Caltech: On Monday, Wednesday, and Friday, we believe general relativity; on Tuesday, Thursday, and Saturday, we believe the Brans-Dicke theory (on Sunday, we go to the beach)" (p. 156).

> ω is adjustable, the predictions of the theory can be made to be as close as desired to those of general relativity….At this point a certain subjectivity must enter the decision as to what is viable and what isn’t.[797]

What Will suggests as the judge of the issue is Occam’s razor, claiming that General Relativity is the simpler approach. In the end, Will has no proof to protect Einstein’s theory. He is left with relativistic mathematical formulae against relativistic mathematical formulae, both claiming to provide the definitive answer, yet neither being able to disprove the other by direct physical evidence.

Relativity: An Approximation

By Charles Lane Poor[798]

The generalized theory of relativity has been accepted as proved; proved by the motions of Mercury and by the bending of light rays near the edge of the sun; phenomena that, according to the relativists, cannot be explained or accounted for by the ordinary methods of astronomical research. Now, how does the relativity theory explain these motions of Mercury, this deflection of light? In what way do the formulas of relativity differ from those of the old fashioned classical mathematics of Newton, La Place, and Leverrier?

The formula of relativity, upon which is based the relativist’s explanations of these phenomena, is found, upon analysis, to be nothing more nor less than an approximation towards the well known formula of Newtonian mathematics. The relativity formula, as used in the astronomical portion of the theory, contains not the slightest trace of the basic postulates of relativity, of warped space, or the mythical fourth dimension. It is a formula of Newtonian gravitation, purely and simply; but an approximate formula, derived by a series of approximations.

In deriving the formulas for the transmission of light throughout space and for the motion of one particle of matter about another, the relativity mathematician encounters a serious difficulty. His formula, derived from the postulates of relativity, indicates that light travels with different speeds in different directions, that the velocity of light depends upon the direction of transmission. That such a mathematical result represents the facts of nature is highly improbable, for in free space there is no difference between right and left, between north and south, or east and west; there is no reason why a ray of light should travel faster to the north than to the south. To overcome this mathematical difficulty, or inconvenience, as he calls it, the relativist makes a substitution, or approximation. Instead of using the direct distance between the centers of two particles of matter, the relativist adds a small, a very small, factor to this distance; or, as Eddington puts it, "*we shall slightly alter our co-ordinates.*" Such an approximation is very common among physicists: it is done every day to simplify troublesome formulas. The only precaution necessary in such a procedure is to remember always that the final result is necessarily approximate, and, before drawing any conclusion, to thoroughly test the effects of the approximation.

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[797] Clifford Will, *Was Einstein Right*?, p. 158.

[798] A paper presented to the American Astronomical Society, 13th meeting, 1923, Mount Wilson Observatory, California.

Now the quantity, *m*, which is thus added to the distance to simplify the relativity equation, represents the mass of the attracting body, expressed in linear relativity units. It is really very small indeed in all physical problems of the laboratory. For all ordinary masses of matter, such as can be handled and experimented with on the earth, this little quantity is very much less than the billionth part of an inch; for the earth itself it is only about one-sixth (1/6) of an inch. As applied to the earth as a gravitational body, the approximation really consists in adding 1/6th of an inch to each and every distance measured from the center of the earth. As the radius of the earth is some 4,000 miles, it is easy to see that for bodies near the surface of the earth this approximation amounts to less than one part in a billion, a quantity absolutely inappreciable in any physical problem; in the case of the motion of the Moon about the earth, this little distance is less than one part in seventy-five billion.

To the physicist such a degree of approximation is amply sufficient; no laboratory methods can measure with this degree of accuracy. But it is radically different in astronomy: distance and motion are on enormous scales and time continues on interminably, and a minute approximation might become evident in the motions of the planets.

Now it must be clearly understood that this minute approximation is the *sole appreciable difference* between the so-called Einstein law of motion and the old fashioned mathematics of Newton. By omitting this approximation and using the exact distance between the centers of the two bodies the Einstein formula becomes identical with that of Newton: on the other hand, if, in the Newtonian formula the approximate distance be used, then this formula becomes identical with Einstein's. There is no essential difference between the two formulas: Einstein's formula is an approximation towards Newton's; except for the approximation, it is Newton's. In the Einstein formula for the orbit of a planet there is not the slightest trace of relativity; there is no warped space, no fourth dimension; there is nothing but every-day, ordinary Newtonian gravitation, but *approximate gravitation.* The approximation is in the Einstein equation; not in the Newtonian.

When the motions of the planets about the sun are considered, it must be remembered that the sun is many thousands of times larger than the earth, and, therefore, the little quantity, m, becomes proportionally larger, being in fact about nine-tenths of a mile. And the relativity approximation consists, in this case, of using in their formulas, not the actual distance of a planet from the center of the sun, but that distance increased by nine-tenths (0.91) of a mile. This same distance, this 9/10ths of a mile, is added to the distance of each and every planet, to that of Mercury, to that of Venus, of Jupiter and of Saturn. In all real astronomical work the position of the center of a planet is always determined from the center of the sun; the center of the sun is the fundamental point of reference in the solar system. No other point is ever used in actual astronomical observations, calculations, or tables; the actual distance of a planet from this point is measured, or calculated, or tabulated. But the relativity approximate formula does not give this actual distance: in the case of each and every planet it gives this distance increased by 9/10th of a mile.

The Motion of the Perihelion of Mercury

It is this approximation, which gives rise to the apparent, or so-called, Einstein motion of an elliptic orbit. According to the Newtonian formula the elliptic orbit of a planet (when the interaction of the other planets is omitted) is fixed in space; according to the Einstein formula the elliptic orbit is in slow motion, so that the perihelion appears to advance. But the Newtonian formula is mathematically exact; the Einstein formula contains an approximation, and the apparent theoretical Einstein rotation of an orbit, the theoretical Einstein advance of the perihelion is due, entirely, to the approximation so contained in his formula. The theoretical orbit of a planet is fixed in space, as shown by the mathematically exact Newtonian formula; there is no Einstein motion of the perihelion; the so-called Einstein rotation of an orbit is a mathematical illusion, caused by using an approximate formula.

But, while the Einstein motion is pure illusion, there is an actual motion of the perihelia of all the planets. When the mutual interactions of the planets, one upon another, are taken into account, then it is found that the orbits of all of them are in motion; the simple elliptic orbits writhe and squirm, so to speak, under the additional forces of the planets themselves. Not a single orbit is at rest, not a single orbit is a true ellipse. The orbit of Mercury, for example, swings around at the rate of 576 seconds of arc per century; that of Mars at the rate of 1606 seconds per century. Leverrier in 1859 computed the action of each and every planet upon the orbit of Mercury, and found that these attractions would account for only 538 seconds or arc, thus leaving an unexplained 38 seconds in the centennial advance of Mercury's perihelion. This is the celebrated discordance, which has been so stressed by Einstein and his followers. Leverrier explained it by the action of an unknown planet, or of masses of matter, between Mercury and the sun. While it is now known that no large planet is there, yet observations and photographs, without number, show clearly the presence of great masses of scattered matter in the very places that Leverrier indicated as necessary to explain this motion of Mercury.

But the relativity approximate formula gives rise to an apparent, or fictitious, motion of the orbit of Mercury of some 43 seconds of arc per century. And it is this approximate coincidence of figures, 43 seconds of illusion as against 38 seconds of actuality, which has been used by Einstein and is followers as proof, conclusive, of the relativity theory. As the relativity advance, as this 43 seconds, is a mere mathematical illusion, as there is, in reality, no such thing as the Einstein rotation of an orbit, this approximate coincidence of figures has no bearing, whatsoever, upon the truth or falsity of the relativity postulates.

The Deflection of Light

There is nothing new in the idea that light may be bent, or deflected, from its course by the action of gravitation. Sir Isaac Newton certainly suspected that bodies might act upon light at a distance, and by their action bend its rays. Such action and such bending, of course, was predicated upon the theory that light consists of material particles of matter, shot forth form the luminous source. Such a material particle, or corpuscle, passing near the sun or other large gravitational mass would naturally describe a planetary orbit about such body, and the bending of the ray would be the amount of curvature in such orbit. The character of the orbit and the amount of curvature, or bending, of the orbit depends entirely upon the velocity with which the particle passes the attracting body. At a certain rather low velocity, the path of the particle is a circle about the gravitating centre: as the velocity increases the circle becomes an ellipse, a parabola, and finally a hyperbola. With each further increase in speed the arms of the hyperbola open out more and more and the path approaches nearer to a straight line.

The velocity of light is so great that the path of a particle, traveling about the sun with that speed, will be an hyperbola, the arms of which are so widely separated as to make the path almost, but not quite, a straight line.

The corpuscular theory of light, as held by Sir Isaac Newton, explained all the optical phenomena known to him. But, during the years which elapsed after his death, new facts were learned and new experiments made. Facts and experiments, which could not be explained or accounted for on this theory, gradually led to the acceptance of the then rival, wave or undulatory, theory of light. With the passing of years, with each new experiment, the wave theory of light became more and more firmly established, until it became one of the fundamental theories, or concepts, of modern science.

Therefore von Soldner's paper on the bending of light rays, which was published in 1801, attracted very little attention. For in this paper he assumed the corpuscular theory of light and calculated the amount that a ray should be bent in passing near the sun. He treated light as being material, a particle of light being attracted by the sun in the same way as a planet, and obeying the same laws of motion. He treated the problem of finding the light deflection in exactly the manner one would treat the path of a minute planet, which travels about the sun with the speed of light. He applied to the problem the ordinary, every-day, formulas of Newtonian gravitation.

It can be readily shown that, under the Newtonian laws of motion, a minute planet, traveling about the sun with the speed of light in a path which just grazes the surface of that luminary, will travel in an hyperbolic orbit; in a curve which is almost, but not quite a straight line. A very simple calculation shows that the total amount of bending in such path amounts to only 0.87 seconds or arc. This is the so-called "Newtonian" deflection. If the Newtonian, or corpuscular theory of light be true then all rays of light, grazing the edge of the sun, will be bent, or deflected from their straight paths by this amount, by 0.87 seconds of arc.

Now Einstein, in his generalized theory of relativity, introduces a factor two (2) into the formula for the bending of light rays, and gives the total deflection of a ray, passing the sun, as double the above amount, as 1.75 seconds of arc. This theoretical Einstein bending of a light ray is found, by Eddington and others, from the relativity equations by the use of the celebrated principle of equivalence. Under this principle of relativity, the track of a ray of light "*agrees with that of a material particle moving with the speed of light*." The principle of equivalence, so stated, appears to be nothing more nor less than an assumption of the truth of the corpuscular theory of light; yet the relativist never distinctly acknowledges this assumption, never distinctly states which theory of light is to be accepted. To explain certain phenomena the wave theory seems to be used by the realtivists; other phenomena, under the principle of equivalence, by the corpuscular theory. Is not the principle of equivalence, so used, a handy device for passing readily form one theory to another as necessity drives?

But let us assume, with the relativist, the validity of the principle of equivalence, and from this principle find from the relativist's own formulas the track of a ray light. The fundamental formula of relativity dynamics is given by Eddington and it differs from that of Newtonian mathematics by a single small term (which has been shown to be the result of an approximation). From this fundamental differential formula the relativist finds the path of a planet, and the track of a ray of light; finds the motion of the perihelion of Mercury, and the deflections of the rays from distant stars as they pass near the eclipsed sun. According to the principle of equivalence there is no essential difference between these two cases: Mercury travels about the sun at the distance of many millions of miles and at a comparatively slow speed; the ray of light grazes the edge of the sun and travels at a terrific velocity. But the same formula applies to both cases; substitute in it the speed and distance of Mercury for the motions of Mercury; substitute in it the speed and distance of the ray of light and obtain the track of such ray.

Now Eddington integrates this fundamental equation of relativity dynamics and finds the complete path of any body, Mercury, Jupiter, or a material particle travelling with the speed of light. This complete and general orbit of any body, of Mercury or of a ray of light, is given by Eddington in his discussion of the motion of the perihelion of Mercury, and this orbital equation of relativity, so given by Eddington, differs from the ordinary equation of celestial mechanics by a single small term, by the term which gives rise to the so-called relativity motion of the perihelion. According to repeated statements of Einstein, of Eddington and of other relativists, according to the printed formulas of relativity, the relativity orbit, or path of a body is identical with that of Newtonian mathematics, with the single exception of this perihelial motion. This complete formula for the orbit of a body is used by the relativists to find the so-called motion of the perihelion of Mercury, to find the celebrated 43 seconds of arc, upon which is based the Mercurial proof of the Einstein theory.

But, upon the equivalence principle, this same orbital equation should give the track of a ray of light, passing near the sun. Substituting in this equation the distance of the ray from the sun's centre and its speed, the resulting orbit, or track of a ray is a hyperbola, and the total deflection, or bending is easily shown to be 0.87 seconds of arc, agreeing identically with that found from the Newtonian equation. This is necessarily so, for the two equations are the same, with the exception of the small term, which gives rise to the motion of the perihelion. In the case of Mercury, this minute term appears to give a motion of the perihelion of 0.103 seconds of arc in one revolution of the planet in its orbit (42.7 seconds per century): in the case of a ray of light, the same term amounts to about only *thirty-five millionths* (0.000,035) of a second of arc, a quantity absolutely negligible.

That is, the very formula, used by the relativists to prove their theory by the motion of Mercury, *disproves* their computed value for the light deflection. This equation, their own equation, gives the so-called Newtonian value, 0.87 seconds of arc, for the bending of a ray of light by the gravitational action of the sun.

The relativist, however, does not use this orbital equation in his calculations of the amount of the light deflection. He reverts to the fundamental differential equation and integrates it in an entirely different manner for the track of the light ray. This second method of integrating the fundamental equation is, however, frankly approximate and gives a result which applies solely to light. Before beginning the integration, Eddington discards a term from the fundamental equation as being, in the case of light, infinitely small in comparison with other terms in the equation. This simplifies the equation, and the integration of the thus mutilated equation results in a curved path, which may approximate that of a light ray, but which is clearly approximate. The total bending, resulting from the use of this approximate path, is the relativity figure of 1.75 seconds of arc.

The validity of this method depends upon the question as to whether the discarded term is really very small with respect to those retained, or not. The omitted term is a constant, while the value of the term retained varies with the movement of the light particle along the curved orbit. A very simple comparison[11] of this rejected term with the one retained shows that, in the most favorable case, the term, *I/P,* which Eddington omits as negligibly small, is two-thirds (2/3rds) as great as the term which he retains. Two-thirds can hardly be called negligibly small in comparison with unity. Further, except for a minute portion of the curve near perihelion, the omitted term *I/P* is actually very much *larger* than the term, $3mu^2$, which is retained. Eddington, in fact, omits as negligibly small, the large, important term of the equation, and retains the insignificant term.

It would thus seem that the approximation used by Eddington to integrate the equation for the deflection of light is *invalid*, and that the resulting value for the bending of the light ray is erroneous. Both methods of integrating the fundamental relativity equation cannot be right: one or the other must be wrong. The first and more general method, as we have seen, is used by the relativist to obtain the so-called relativity motion of the perihelion of Mercury, but this method gives the deflection of light only 0.87 seconds of arc; the second method is restricted to light, is frankly approximate, and gives the amount of the deflection as 1.75 seconds. The same equation is handled by the relativist in two different ways and gives two radically different results. Which result is correct?

The relativist apparently checks his invalid calculation by the use of an entirely different method, a physical method of determining the deflection. But the method is faulty and contains obvious errors, and the fundamental formula for the velocity of light, upon which the entire method is based, is in direct contradiction to the principle of equivalence, for it shows that the speed of light *decreases* as it approaches the sun, while the equivalence principle demands that such velocity should increase.

It would thus seem that the calculations by which Eddington finds the deflection of light equal to 1.75 seconds of arc are invalid. The principle of equivalence, if true, shows that the total bending of a ray of light, passing near the sun, is 0.87 seconds of arc, and not the 1.75 seconds, as claimed by the relativists.

Conclusions

1. The fundamental formulas of relativity dynamics contain an approximation; the *r* of these formulas is not the direct distance between the centres of two particles of matter; it is this distance increased by a minute quantity.

2. The relativity formulas can be obtained directly from the corresponding Newtonian formulas by the introduction of the relativity approximation.

3. The relativity motion of the perihelion of an orbit is a mathematical illusion, due entirely to the use of the relativity approximation. The elliptic orbit of a particle of matter is fixed in space (when the interaction of the other planets is omitted).

4. The supposed confirmation of the Einstein theory by the motion of the perihelion of Mercury depends entirely upon the use of the approximation in the relativity formulas: when the approximation is removed from the formulas, all appearances of confirmation vanish.

5. Under the generalized theory of relativity, through the principle of equivalence, a ray of light, passing near the sun, will be bent by the same amount as under the corpuscular theory of light. The theoretical bending being thus the same for these two theories, a deflection, observed at an eclipse, cannot be used to prove the truth of the relativity theory as against that of the corpuscular theory of light.

6. The figure, 1.75 seconds of arc, given by the relativists for this deflection is obtained by approximate and invalid calculations. The relativists own formulas give, as they should under the principle of equivalence, 0.87 seconds, and not 1.75.

The amount of deflection observed at the 1922 eclipse cannot be explained, either by the Einstein theory or by the corpuscular theory of light. Such deflection, if confirmed by later eclipses, will have to be explained on other grounds, by some purely physical cause, or by a combination of causes.

Appendix 7

Does the Hefele-Keating Experiment Prove General Relativity?

Ever since Einstein proposed his General Relativity theory in 1916 the science community has been trying to offer observable proof for its claims. The bending of light near the sun, the residual perihelion of Mercury, the time dilation of μ-mesons and a few other candidates, have tried but failed to provide the necessary proof. As noted earlier, it is not difficult to make it *appear* as if proof exists, since the mathematics on either side of the equation can easily be adjusted to fit with the proposed theory. Accordingly, Relativist Clifford Will admits: "General Relativity has passed every solar-system test with flying colors. Yet so have alternative theories."[799] Obviously, the mathematics of General Relativity and the "alternative theories" all work, but at most only one theory can represent the true reality. Besides mathematics, however, there are other "adjustments" that scientists employ to get the "right" result. Such is the case with the Hefele-Keating experiment.

As we know, Relativity proposes that time runs slower for an object in motion than for an object at rest. To help prove this postulate, in October 1971, J. C. Hefele and Richard E. Keating placed cesium beam atomic clocks upon commercial jets, having one jet fly eastward and one jet fly westward.[800] To minimize the effects of the Earth's magnetic field, the clocks were triple-encased. Another clock was placed at ground level and kept in place at the United States Naval Observatory. When the clocks were compared, Hefele and Keating reported that the flying clocks differed from the ground clock within the margin of error predicted by the theory of Relativity. According to Relativity, the eastbound clock should have lost 40 ± 23 nanoseconds while the westbound clock should have gained 275 ± 21 nanoseconds. The results were reported as follows: the eastbound clock had lost 59 ± 10 nanoseconds and the westbound clock increased by

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[799] Clifford Will, "The Confrontation Between Gravitation Theory and Experiment," General Relativity: An Einstein Centenary Survey, ed., Stephen W. Hawking, Cambridge University Press, 1979, p. 62.

[800] J. C. Hefele and R. E. Keating, "Around-the-world atomic clocks: predicted relativistic time gains," *Science*, Vol. 177, 1972, pp. 166-168.

273 ± 7 nanoseconds when compared with the ground level clock.[801] These results were released to the world press and treated as just another expected "proof" of Relativity. The truth of what occurred, however, is far different.

First, as in the case of Eddington's eclipse photographs and the calculations on the perihelion of Mercury, the Hefele-Keating experiment was the victim of an inordinate amount of convenient "adjustments." Considering the fact that the differences between classical and Relativistic predictions are very slight, tampering with the evidence can easily swing the results in the favor of one side or the other. As such, Hefele and Keating note that they made many "corrections" for the aircraft's height, direction, speed and latitude. Some of these corrections are based on the so-called "Relativistic" effects associated with an object in motion, and thus the corrections become a case of begging the question.[802] More egregious is the fact that Hefele and Keating did not use all the data they collected. Louis Essen, world renowned for his work in atomic time-keeping, notes that when all of the Hefele-Keating data is summed up, the values change to 134 nanoseconds (ns) for the westward bound clock and

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[801] A nanosecond is one thousand millionth (10^{-9}) of a second. As reported by Hefele-Keating, the predicted results were a product of "Gravitational time dilation" (eastward: 144 ± 14 ns; westward: 179 ± 18 ns) and "Kinematic time dilation" (eastward: -184 ± 18 ns; westward: 96 ± 10 ns), producing a "Net effect" prediction of -40 ± 23 ns eastward; and 275 ± 21 ns westward.

[802] Hefele-Keating registered small changes in gravitational field due to changes in altitude above the Earth by using the relativistic time dilation formula of $T = T_O(1 + gR/c^2)$, where T is the time dilation and T_O is the "proper time" measured in the rest frame of the event. A planned jet flight of 41.2 hours and average altitude of 8900 meters determines the above predicted figures of "eastward: 144 ns"; whereas the flight westward of 48.6 hours and an average altitude of 9400 meters determines the above predicted figures "westward: 179 ns." For the Kinematic time dilation, Hefele-Keating used the standard relativistic formula $T = T_O/\sqrt{(1-v^2/c^2)}$. But because neither the jet nor the Earth's surface are inertial frames, they use the center of the Earth as the inertial frame and the results are calculated as if the master clock were there. This transposes the above equation to $T_S = T_O[1 + R^2\omega^2/2c^2]$, where T_S is the time at the surface of the Earth, T_O is the proper time, R is the Earth's radius, and ω is the angular velocity of the Earth's rotation (assuming diurnal motion occurs). For the airborne clock the formula is $T_A = T_O[1 + (R\omega + v)^2/2c^2]$. Hefele-Keating then note that there is no significant change of R between the Earth's surface and the jet and thus develop the formula $T_A - T_S = T_O[2R\omega v + v^2/2c^2]$ and then replace T_O with $-T_S$ to represent the transition from "Earth center time" to "Earth surface time" to acquire $T_A - T_S = -T_S[2R\omega v + v^2/2c^2]$.

–132ns for the eastward bound clock, approximately a 50% difference in both directions from what was predicted by Relativity. Essen concluded: "I suggest that the theoretical basis of their predictions needs careful scrutiny and that the experimental results given in their paper do not support these predictions."[803] Heeding Essen's words, Alphonsos G. Kelly secured the original documents of the Hefele-Keating experiment from the United States Naval Observatory. Kelly concluded in his abstract:

> The original test results were not published by Hefele and Keating in their famous 1972 paper; they published figures that were radically different from the actual test results which are here published for the first time. An analysis of the real data shows that no credence can be given to the conclusions of Hefele and Keating.[804]

The errors of the cesium clocks were so numerous that Kelly concluded they simply could not be used to provide reliable data. For example, the clocks were often discovered to be out of synch. Hefele and Keating knew about this problem going into the experiment, since they write:

> No two 'real' cesium beam clocks keep precisely the same time, even when located together in the laboratory, but generally show systematic rate (or frequency) differences which in extreme cases may amount to time differences as large as 1 second per day.[805]

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[803] *Creation Research Society Quarterly*, 14:46, 1977, as cited by Malcolm Bowden, adding: "Essen…said his comments had been submitted to a journal but were rejected."

[804] Alphonsos G. Kelly, "Hefele & Keating Tests; Did They Prove Anything?" HDS Energy Ltd, Celbridge, Co. Kildare, Ireland, p. 1, nd.

[805] As cited in "A New Interpretation of the Hefele-Keating Experiment," Domina Eberle Spencer and Uma Shama, p. 1, nd. Spencer and Shama add: "Short term fluctuations in rate are caused mainly by shot noise in the beam tubes. Cesium beam clocks also exhibit small but more or less well defined quasi-permanent change in rate." Kelly adds from the 1970 Winkler, *et al* report: "In a sample of 45 such clocks used at several stations, one failure per six clocks was experienced over two years…During January 1970, three clocks had changed by +16ns, +18ns and –68ns per day. Two others were removed due to poor timekeeping…" (G. M. R. Winkler, R. G. Hall and D. B. Percival, Meterologia 6, No. 4, 126-134, 1970). Beehler's 1965 report stated that the accuracy of smaller portable clocks [used on

Kelly concluded the clocks would need to be at least 100 times more accurate to obtain reliable results. This anomaly is compounded by the fact that scholarly texts have consistently quoted the Hefele-Keating experiment as proof of Relativity, and, as of Kelly's writing, the *Science Citation Index* contained over 1000 references to the 1972 Hefele-Keating experiment. Ironically, Hefele remarks about the anomalies in their experiment in a 1971 report, but these concerns are not published in the 1972 paper released to the public. Hefele writes:

> Most people (myself included) would be reluctant to agree that the time gained by any one of these clocks is indicative of anything…the difference between theory and measurement is disturbing.

More specifically:

> Particularly in the case of [clock #] 361 after the eastbound flight, it is quite uncertain what the rate is after the flight…Portable cesium clocks cannot be expected to perform as well under traveling conditions as they do in the laboratory. Our results show that changes as large as 120 nsec/day may occur during trips with clocks that have shown considerably better performance in the laboratory.[806]

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the aircraft] is worse, by a factor of two, than large stationary clocks (R. E. Beehler, R. C. Mockler and J. M. Richardon, Meterlogia 1, No. 3, 114-131, 1965). Kelly adds:

> H & K [Hefele and Keating] claimed that they chose the four clocks because they showed a steady drift rate for at least 24 hours before the tests. It was hoped that they would continue as a steady rate during the tests…Three of the four clocks were so poor in this regard as to render them useless...Clock 120 was a disaster; it had a change from losing 4.50 ns per hour to losing 8.89 ns per hour on the Eastward trip; on the Westward trip it altered from losing 8.88 to losing 4.56 ns per hour. An examination of Table 1 shows that, with the single exception of clock 447, the drift rates were so far from being steady as to render the results totally useless….That erratic clock had contributed all of the alteration in time on the Eastward test and 83% on the Westward test, as given in the 1971 report. Discounting this one totally unreliable clock, the results would have been within 5 ns and 28 ns of zero on the Eastward and Westward tests respectively" (*ibid.*, pp. 2, 3, 6).

[806] As cited in Kelly's *Hefele and Keating Tests*, p. 3.

Considering the drift rates and fluctuations, Kelly shows that Hefele and Keating's predicted result of –40ns eastward is easily accounted for if the actual flight time of 65.4 hours is divided by a drift rate of merely 0.6ns per hour. Likewise, the predicted result of 275ns westward would be accumulated in actual flight time of 80.3 hours at a slight drift rate of +3.4ns per hour. But more important is the manner in which Hefele and Keating obfuscated the blatant contradictions in their data. Kelly notes that Hefele and Keating's "corrections" were shocking. For example, for the eastward traveling clock #408, they "corrected" the reading from +166ns to –55ns; for the westward traveling clock #361, they "corrected" the reading from –44ns to +284ns; for the westward traveling clock #447 the change was from +26ns to +266ns, yet their 1972 published paper said "no significant changes in rate were found for clocks 408 and 447 during the westward trip." Kelly remarks: "This barefaced manipulation of the data was outrageous," adding elsewhere:

> The trend [of Hefele and Keating's data] was derived from the *average* of the four clocks. The results from the individual clocks were not disclosed; they are published here for the first time…Taking the mathematical average…is meaningless; on the Eastward trip, clock 408 gained 166ns, while the theory forecast a loss of 40ns; on the Westward trip clock 361 lost 44ns, while the theory forecast a gain of 275ns![807]

Kelly notes that Hefele and Keating recognized these unpredicted anomalies and at first tried to compensate for them by taking an average of the drift rates, but, as they said themselves, they soon realized this was a mere rationalization that "depended on the unlikely chance that only one rate change occurred during each trip and that this change occurred at the midpoint of the trip." Astoundingly, Hefele and Keating ignore their own warnings and publish their graphs based upon the very method they themselves had rejected as deficient, and then proceeded to describe them as "convincing qualitative results"! As Kelly notes: "It was published because it looked convincing and not because it gave a legitimate picture of the test results. To the unsuspecting reader, these graphs looked like proof of the success of the tests." His final remark is: "Only one clock (447) had a fairly steady performance over the whole test period; taking its results gives no difference for the Eastward and the Westward tests." Not surprisingly, Kelly notes that Hefele and Keating did a similar test a year prior in 1970 and found that there was no discernible time dilation in the cesium clocks. It seems that after obtaining such null results they were determined to find positive results in the following year.[808]

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[807] Kelly, *Hefele and Keating Tests*, p. 4. Kelly details the results from the trial data that Hefele and Keating did not disclose in their report: Clock #120: lost 196ns, lost 52ns, lost 57ns, gained 413ns, gained 240ns, gained 277ns; Clock #361: lost 54ns, lost 110ns, lost 74ns, lost 44ns, gained 74ns, gained 284ns; Clock #408: gained 166ns, gained 3ns, lost 55ns, gained 101ns, gained 209ns, gained 266ns; Clock #447: lost 97ns, lost 56ns, lost 51ns, gained 26ns, gained 116ns, gained 266ns.

Essen and Kelly are not the only ones to examine the original data of the Hefele-Keating experiment. Among the more prominent is Domina Spencer, who with Parry Moon, has been critiquing Relativity theory since the 1950s. Spencer's abstract assures us that, after her analysis of the raw data supplied to her by Dr. Keating:

> Thus, one of the essential experimental supports of the relativistic theory of time dilation is shown to be invalid. Instead, the original data provide additional strong support of the reality of the universal time postulate on the velocity of light.[809]

So not only is the Hefele-Keating experiment non-supportive of Relativity theory, in an ironic twist of fate it has brought us back to the universal time clock of Isaac Newton. In this area Spencer and Moon have done considerable work.[810] Remarking on the misinterpretations of Hefele and Keating on their own experiment, she writes:

> In order to obtain the time changes predicted by Einstein's theory of relativity, Hefele and Keating do something which is

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[808] Kelly, *Hefele and Keating Tests*, p. 7.

[809] Domina Eberle Spencer and Uma Shama, *A New Interpretation of the Hefele-Keating Experiment*, p. 1, nd.

[810] P. Moon, D. E. Spencer, "On the establishment of universal time," *Phil. Sci.*, Vol. 23, 1956, p. 216; P. Moon, D. E. Spencer and E. E. Moon, "Universal time and the velocity of light," *Physics Essays*, Vol. 2, 1989, p. 268f; P. Moon and D. E. Spencer, "Binary stars and the velocity of light," *Journal of the Optical Society of America*, Vol. 43, 1953, p. 635f; P. Moon, D. E. Spencer and E. E. Moon, "The Michelson-Gale experiment and its effect on the postulates of the velocity of light," *Physics Essays*, Vol. 3, 1990, p. 431f; P. Moon, D. E. Spencer and U. Y Shama, "The Sagnac effect and the postulates on the velocity of light," *Physics Essays*, Vol. 4, 1991, p. 249f; D. E. Spencer and U. Y. Shama, "Stellar Aberration and the Postulates of the Velocity of Light," *Physics Essays*, 1996.

> very surprising. They assume that, although the data…are never linear, somehow when the airplane is in motion the curves become linear. And they assume that the slope of this straight line is the average of the data for the 25 hours before the trip. Has the clock a foreknowledge that it is about to travel on an airplane around the world?[811]

All this analysis may be beside the point when we consider the contradiction that is inherent in the actual foundation of the Hefele-Keating experiment. Hefele and Keating claimed to be measuring the time dilation of cesium clocks in motion against a stationary cesium clock at ground level, but the whole basis of Relativity theory is that one cannot determine, or even regard, one location as being at rest while the other is in motion. This objection was clearly denunciated in a comprehensive critique written by W. A. Scott Murray.[812] Hefele and Keating seem to have anticipated the objection and thus try to circumvent it by stating:

> Because the Earth rotates, standard clocks distributed at rest on the surface are not suitable in this case as candidates for coordinate clocks of an inertial space. Nevertheless, the relative timekeeping behavior of terrestrial clocks can be evaluated by reference to hypothetical coordinate clocks of an underlying nonrotating inertial space.

Yet they proceed to admit that:

> It is important to emphasize that special relativity purports to describe certain physical phenomena only relative to (or from the point of view of) inertial systems, and the speed of a clock relative to one of these systems determines its timekeeping behavior.[813]

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[811] Domina Spencer, "A New Interpretation of the Hefele-Keating Experiment," p. 2.

[812] W. A. Scott Murray, "If you want to know the time…" *Wireless World*, December, 1986, pp. 28-31.

[813] J. C. Hefele and R. E. Keating, "Around-the-world atomic clocks: predicted relativistic time gains," *Science*, Vol. 177, 1972, pp. 166-168. W. A. Scott Murray develops this line of critique in "If you want to know the time…" *Wireless World*, December 1986, vol. 92, n 1610, 28-31.

The fact is, however, that there is no inertial system from which Hefele and Keating can measure their so-called time dilation, unless, of course, they are willing to adopt a motionless Earth as the base for their ground clock. Of course, if they admit the Earth is motionless, it makes experiments designed to prove Relativity an exercise in futility.

Appendix 8

Does the Global Positioning System Prove General Relativity?

The Global Positioning System (GPS), although invaluable in providing us with a very precise navigation system is, nevertheless, understood by science to be a large-scale version of Sagnac's rotating interferometer, and thus a thorn in the side of Relativity theory. This was proven in 1984 when GPS technician D. W. Allan and a team of international scientists measured the same effect on light as Sagnac did in 1913.[814] In this instance the Global Positioning Satellites, whose distance above Earth is approximately 24,000 km (app. 14,900 miles), act as a giant interferometer, so to speak. When an electromagnetic signal is sent from the ground station to the GPS, the signal takes 0.08000 seconds to arrive. However, since the GPS is rotating around Earth, some of the signals sent from the ground will arrive either at an approaching or a receding GPS satellite. Allan and his colleagues found that microwave beams sent to an approaching GPS satellite take 50 nanoseconds less time to reach the satellite than beams sent to a receding satellite. The 50-nanosecond difference in travel time of light would equal, proportionately, the 0.05 - 1.0 fringe shift in the 1913 Sagnac experiment. Once again, we have confirmation that the speed of light is not the same for all observers. Unfortunately, these facts are not advertised either by the Relativists or GPS mechanics. Rather than admit this flaw in Special Relativity, the 50-nanosecond difference is now automatically built into the computer programs for the GPS since each GPS unit must, without exception, take into account the Sagnac effect (that light beams emitted on a rotating device do not travel the same distance in the same time if they are sent out in opposite directions) in order for the GPS to keep accurate time and determine proper coordinates on Earth.

To keep the GPS within at least a meter of determining a designated location on Earth, the GPS clock must be accurate to within 4 nanoseconds, which requires a time stability ratio on the order of $1{:}10^{13}$, and thus atomic clocks are employed for this purpose (*e.g.*, cesium clocks). Even then, the GPS requires frequent uploads of "clock corrections" to keep everything in synch. When the clocks are in synch, still, it is an inevitable occurrence that GPS signals directed to an approaching ground station arrive at least 50 nanoseconds prior to signals sent to a receding ground station. Even when making adjustments for the Doppler effect and gravitational redshift, there still remains a margin of error due to the Sagnac effect. If these factors are not taken into account, a GPS could be off by as much as 11 km (6.8 miles) in one day. Relativists, assuming their theory to be correct, explain these differences by claiming they are due to "relativistic" effects (*e.g.*, "time dilation") upon light moving in a non-inertial frame. This is precisely the explanation that D. W. Allan proposed in 1984. This explanation, of course, is simply begging the question, since one cannot use as proof that which has not first been proven. Here is how one Relativist explains his methodology:

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[814] D. W. Allan, D. D. Davis, M. Weiss, A. Clements, B. Guinot, M. Granveaud, K. Dorenwendt, B. Fischer, P. Hetzel, S. Aoki, M. K. Fujimoto, L. Charron, and N. Ashby, "Accuracy of International Time and Frequency Comparisons Via Global Positioning System Satellites in Common-View," *IEEE Transactions on Instrumentation and Measurement*, IM-34, No. 2, 118-125, 1985. (BIN: 689); Also cited in *Science*, 228: 69-70, 1985.

> …the simplest approach is to use an approximate solution of the [General Relativity] field equations in which Earth's mass gives rise to small corrections to the simple Minkowski metric of Special Relativity, and to choose coordinate axes originating at the planet's center of mass and pointing toward fixed stars. In this Earth-centered inertial reference frame (ECI), one can safely ignore relativistic effects due to Thomas precession or Lense-Thirring drag. The gravitational effects on clock frequency, in this frame, are due to Earth's mass and its multipole moments.[815]

One wonders, with the assortment of intersecting theories described above, why the author thinks this is "the simplest approach." We notice that his proposed solution not only appeals to remedies that are themselves imprecise (*e.g.*, "approximate solution of [GTR] field equations") or speculative ("Minkowski metric of Special Relativity," or "Lense-Thirring drag"), but also shows his dependence on an "Earth-centered" inertial frame in order to allow his "relativistic" theories to explain how the GPS functions. The author confirms his objective in another paragraph:

> …the leading contribution to the gravitational potential Φ is the simple Newtonian term $-GM_E/r$. The picture is Earth-centered, and it neglects the presence of other Solar System bodies such as

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[815] Neil Ashby, "Relativity and the Global Positioning System," *Physics Today*, May 2002, p. 3.

> the Moon and the Sun. That they can be neglected by an observer sufficiently close to Earth is a manifestation of general relativity's equivalence principle. In the ECI frame, the only detectable effects of distant masses are their residual tidal potentials.[816]

We notice here that the goal is to obtain an "Earth-centered" inertial frame, and thus he uses Newtonian formulas rather than Relativistic formulas since the latter are much more complicated. So far, the GPS technician has shown that he is partial to a geocentric map, but allows himself the prerogative of translating Earth-centered mechanics into a Relativistic framework to explain the same effects from a non-centered, non-inertial Earth frame. The reason he must do so is that it is next to impossible to make accurate measurements when the objects one is trying to measure keep moving, as the Earth does around the sun in the heliocentric system. Moreover, without giving his reader any details, the technician also allows himself to justify his use of a geocentric frame by employing the same "detectable effects of distant masses" and their "tidal potentials" from the sphere of stars surrounding Earth as geocentric scientists do. In other words, many geocentrists hold that the forces we experience on Earth (*e.g.*, gravitational tidal effects, centrifugal, Coriolis and Euler forces, *etc.*) are due to the rotation of billions of stars around the Earth as they distribute their enormous gravitational effects and angular momentum.[817] In fact, in Ashby's reference to "general relativity's equivalence principle," it is conceded by Relativists that a fixed-Earth around which the stars rotate (*e.g.*, geocentrism) is precisely "equivalent" to a fixed-star system and a rotating Earth (*e.g.*, heliocentrism). Thus, Ashby would have to admit that the “fixed stars” to which he referred in the above opening paragraph would not be fixed in an “Earth-centered inertial” frame since, if Earth is in the inertial position, the stars must be moving against that inertia.

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[816] *Ibid.*, p. 4. It is also interesting that Ashby's footnote on the "equivalence principle" cites "N. Ashby, B. Bertotti, *Physical Review D* 34, 2246 (1986)" as supporting documentation for the principle, yet Bertotti is well-known in geocentric circles as providing one of the best mathematical models of a geocentric universe, which was published nine years before Ashby wrote the above article with Bertotti (Barbour and Bertotti, *Il Nuovo Cimento* B, 38:1, 1977). In this mathematical treatise, Barbour and Bertotti employ Machian physics to show the equivalence of the heliocentric system and a geocentric system. See the further treatment of Barbour and Bertotti in Chapter 9.

[817] Heliocentrists are quite aware of this "enormous" force of gravity, since they hold that the sun is held in its 300 km/sec orbit by the gravity at the center of the Milky Way, and the Milky Way itself is moving at a clip of 600 km/sec because it is being pulled by gravity toward the constellation Orion, and such is the case for all the galaxies and various other objects in the universe – all are caused to move by gravity, and a gravity which propagates instantaneously (something Relativity has yet to answer).

The author reinforces our analysis of his methodology in another revealing paragraph:

> Computations of satellite orbits, signal paths, and relativistic effects appear to be most convenient in an ECI frame. But navigation must generally be done relative to the Earth’s surface. So GPS navigation messages must allow users to compute the satellite positions in a fixed-Earth, rotating coordinate system, the so-called WGS-84 reference frame.[818]

That is, navigators working on the surface of the Earth would find it difficult to keep track of satellites moving against an inertial Earth because the satellite’s positions would constantly be shifting as the satellite orbited the Earth. Thus, the WGS-84 coordinate system was invented. This system makes it appear as if the satellites are moving precisely the same speed as the Earth’s rotation. In other words, the WGS-84 (World Geodetic System of 1984)[819] is the “coordinate system” which is fixed to the Earth. Thus, one could say that the satellites are moving in a one-to-one correspondence with the Earth's rotation, or, from the geocentric perspective, one can say that the Earth and the satellites are motionless. Ashby then explains the WGS-84 reference frame more specifically:

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[818] *Ibid.*, p. 5. Related to this is Gerardus Bouw’s observation of the history of satellite operation: “Now some will argue that since the satellites sent up by NASA use heliocentrically-derived equations, that our space program is a testimony to the success of heliocentrism; but this erroneously assumes that the geocentrically derived equations would be different. Such has been shown not to be the truth. The equations of motion are identical in both models. At least a half-dozen scientific papers since 1916 have shown that to be the case. The only differences between the two models are philosophical and theological” (*Bulletin of the Tychonian Society*, No. 46, 1988, p. 32).

[819] WGS84 is an “Earth-Centered, Earth-Fixed” (ECEF) Cartesian coordinate system. Satellite coordinates are computed relative to the ECEF. The Cartesian coordinates consist of the x-axis extending from the center of the Earth outward through the intersection of the equator and the Prime Meridian (longitude = 0°), and z-axis outward along the Earth’s spin axis - through the north and south poles. The y-axis is orthogonal (perpendicular) to both x-axis and z-axis. The entire coordinate system rotates with the Earth, and is thus, “Earth-fixed.” Satellite positions (and predicted positions) are determined in ECEF time-position quadruples: (x, y, z, t), *i.e.*, x-y-z ECEF coordinates, a function of time. The four defining parameters of the WGS84 ellipsoid are: Semi-major axis (a): 6378137m. Ellipsoid flattening (f): 1/298.257223563 (derived from the value of the normalized second degree zonal harmonic coefficient of the gravitational field: -

> The navigation messages provide fictitious orbital elements from which a user can calculate the satellite's position in the rotating WGS-84 frame at the instant of its signal transmission. But this creates some subtle conceptual problems that must be carefully sorted out…For example, the principle of the constancy of *c* [speed of light] cannot be applied in a rotating reference frame, where the paths of light rays are not straight; they spiral.[820]

In reality, the orbits are "fictitious" because the satellites are not really going the same speed as the Earth's supposed rotation. Along the way, the author has admitted one of the anomalies of Relativity theory, that is, that the speed of light is not constant in a rotating frame of reference. This is the salient fact that the 1913 Sagnac experiment demonstrated, but the author doesn't seem bothered by the fact that he has no explanation why the constancy of light does not hold up in such cases, except to say that light has a problem staying at *c* when it is required to move in curved paths. Interestingly enough, in his famous 1905 paper, Einstein attempted to apply his Special Theory of Relativity to systems in rotation, as he did, for example, when he compared a clock at the North Pole with a clock circling the equator. But he found that his theory couldn't explain how light moved in rotating systems, so the General Relativity theory was invented in order to answer Sagnac's results. Since General Relativity incorporates the remaining universe, the Relativist

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484.16685×10^{-6}). Angular velocity of the Earth (w): 7292115×10^{-11} rad/sec. The Earth's gravitational constant (atmosphere included) (GM): 3986005×10^{-8} m^3/sec^2. GPS receivers receive the transmission time from each satellite using the synchronization capabilities of each message signal. The receiver then records the time the signal was received and, based on the travel time at the speed of light, the distance traveled between the satellite and the GPS receiver is determined. Given 4 satellites in view of a GPS receiver of unknown location, 4 ranges are explicitly known via the timing of the transmitted messages. As before, satellite vehicle x, y, and z coordinates in ECEF-space are known through the satellite ephemeris messages transmitted by each satellite. After unknown position coordinates are determined in the ECEF reference, a coordinate rotation matrix rotates each of the ECEF-matrix row vectors into local coordinates, *i.e.*, latitude, longitude, and elevation with respect to the WGS-84 datum.

[820] *Ibid*., p. 5.

could now appeal to the “distant rotating masses” (*i.e.*, the “fixed” stars which suddenly were not so “fixed”) that produce “counter-rotation effects” upon Earth. This explanation, if one recalls, is the same one that Ashby proposed as an explanation for an “Earth-centered inertial” system in “general relativity’s equivalence principle” in which the “detectable effects of distant masses are their residual tidal potentials.”

The author now gets to the heart of the matter regarding the Sagnac effect:

> One of the most confusing relativistic effects – the Sagnac effect – appears in rotating reference frames. The Sagnac effect is the basis of ring-laser gyroscopes now commonly used in aircraft navigation. In the GPS, the Sagnac effect can produce discrepancies amounting to hundreds of nanoseconds.[821]

It is only “confusing” to Relativists because they can’t explain Sagnac’s effects without resorting to obtuse tensor calculus and the invoking of “conditions” they have no way of proving true, invariably resorting to circular reasoning. In other words, they have no physical explanation for why one beam in Sagnac’s interferometer traveled slower than the other beam; rather, they only account for Sagnac’s effect (and they must or else their GPS satellites will be off by “hundreds of nanoseconds”) by creating “relativistic” mathematical equations. But mathematical equations explain very little about the causes for a particular phenomenon. Equations only make one side equal to the other, but with integers on either side that do not necessarily represent the physical processes taking place.

In regard to the “fixed-earth” concept, the author reminds his readers:

> Observers in the non-rotating ECI inertial frame would not see a Sagnac effect. Instead, they would see that receivers are moving while a signal is propagating. Receivers at rest are moving quite rapidly (465 m/s at the equator) through the ECI frame. Correcting for the Sagnac effect in the Earth-fixed frame is equivalent to correcting for such receiver motion in the ECI frame.[822]

Here the author is admitting that if the system is not rotating, there would be no Sagnac effect, yet it would appear as another effect (*i.e.*,

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[821] *Ibid.*, p. 5.

[822] *Ibid.*, p. 6.

"receiver motion"). He still hasn't explained why a Sagnac effect exists in a rotating system (except to point out the anomaly of Relativity theory that light doesn't behave the same when it is not moving in straight lines). What he has failed to consider is that these anomalies are not "relativistic" effects, but *physical* effects caused by the medium through which light must travel, the very thing that Sagnac demonstrated by his 1913 experiment. Sagnac's experiment did not prove "time dilation" or "rotational effects" but, through a device showing that when light came up against a medium or a force that impeded its speed and made it arrive at the destination in more time than expected, it demonstrated none other than the presence of absolute motion in a space, a motion that Einstein dismissed as "relativistic." Answering this by appealing to "time dilation" is merely an attempt to paint the phenomenon by the phenomenon itself, which doesn't explain anything, except one's biased perceptions.

In another paragraph, Ashby tries to cover over the inadequacies of Relativity to answer the GPS anomalies:

> The Sagnac effect is particularly important when GPS signals are used to compare times of primary reference cesium clocks at national standards laboratories far from each other….A Sagnac correction is needed to account for the diurnal motion of each receiver during signal propagation. In fact, one can use the GPS to observe the Sagnac effect. Of course, if one works entirely in the nonrotating ECI frame, there is no Sagnac effect.[823]

Two experts in the field of GPS mechanics answer Ashby's claims by an even more acute interpretation of the Sagnac experiment. Wang and Hatch state that:

> The simplest interpretation of the result [of the Sagnac experiment] is that the speed of light remains constant relative to the center of rotation and, thus, not of constant speed relative to the rotating detector. Special Relativity (SRT) claims the Sagnac effect is due to the rotation. Since rotation is not relative, the Sagnac effect can be due to non-isotropic light speed and still be consistent with Special Relativity. The effect of the movement of the receiver during the transit time of a GPS signal is referred to in the GPS system as the one-way Sagnac effect. However, it is not at all evident that the Sagnac effect is due to rotation…the

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[823] *Ibid*., p. 6.

> Sagnac effect exists not only in circular motion, but also in translational motion.[824]

The authors leave no escape, since Ashby can no longer hide behind Relativity's appeal to "rotational" motion as its only handicap. Since translational motion also produces a Sagnac effect, Ashby has no safe havens to which he can retreat. Along these lines, Wang and Hatch add the following:

> We have even more convincing data that Ashby's claim is false. NavCom Technology, Inc. has licensed soft-ware developed by the Jet Propulsion Lab (JPL) which, because of historical reasons, does the entire computation in the ECI frame. Because of some discrepancies between our standard earth-centered earth-fixed solution results and the JPL results, we investigated the input parameters to the solution very carefully. The measured and theoretical ranges computed in the two different frames agreed precisely, indicating that the Sagnac correction had been applied in each frame.
>
> As the discussion of the Sagnac effect indicates, the fundamental question regarding the speed of light is the following: Is the speed of light constant with respect to the observer (receiver) or is it constant with respect to the chosen inertial ECI frame? Clearly the GPS range equation indicates the speed of light is constant with respect to the chosen frame…The JPL equations, used to track signals from interplanetary space probes, verify that the speed of light is with respect to the chosen frame. In the JPL equations, the chosen frame is the solar system barycentric frame….Clearly, the JPL equations treat the speed of light as constant with respect to the frame – not as constant with respect to the receivers.[825]

In other words, the Jet Propulsion Laboratory employs the Earth Centered Inertial frame (ECI) for probes sent out near the Earth (as does

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[824] Ruyong Wang and Ronald R. Hatch, *Conducting a Crucial Experiment of the Constancy of the Speed of Light Using GPS*, ION GPS 58th Annual Meeting / CIGTF 21st Guidance Test Symposium, 2002, p. 500.

[825] Ruyong Wang and Ronald R. Hatch, *Conducting a Crucial Experiment of the Constancy of the Speed of Light Using GPS*, ION GPS 58th Annual Meeting / CIGTF 21st Guidance Test Symposium, 2002, p. 500.

NASA and the GPS), yet they claim to use the "solar system barycentric frame" for deep space navigation. But Wang and Hatch tell us: "the Jet Propulsion Lab…because of historical reasons, does the entire computation in the ECI frame." So, not only does the Jet Propulsion Lab use the ECI frame exclusively, Wang and Hatch tell us that the Lab corrects the calculations in its "solar system barycentric frame" so that they match the ECI frame! In other words, the ECI frame is the standard, and thus, use of the solar system barycentric frame is superfluous. Once the Lab's computer makes the corrections to the solar system barycentric frame, in reality the deep space navigation is actually using the ECI frame – a fixed Earth. The public wouldn't have been made privy to this sleight-of-hand manipulation except for the fact that two knowledgeable insiders, Wang and Hatch, have told the real story. In effect, the Earth Centered Inertial frame (*e.g.*, geocentrism) is the only frame that will allow the GPS and various space probes to work properly.

Ashby later writes:

> The Sagnac effect also occurs if an atomic clock is moved slowly from one reference station on the ground to another. For a slow clock transport, the effect can be viewed in the ECI frame as arising from a difference between the time dilation of the portable clock and that of a reference clock whose motion is solely due to Earth's rotation. Observers at rest on the ground, seeing these same asymmetric effects, attribute them instead to gravitomagnetic effects – that is to say, the warping of spacetime due to spacetime terms in the general-relativistic metric tensor. Such terms arise when one transforms the invariant ds^2 from a nonrotating reference frame to a rotating frame.[826]

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[826] *Ibid*., p. 6. To counter this, Van Flandern cites the phenomenon wherein a high-altitude GPS clock runs 46,000 nanoseconds faster per day than a clock at ground level. He attributes this difference not to Relativistic effects, but to the fact that the gravitational field is weaker at high altitudes, and thus the atom exchange in atomic clocks have less gravity against which they must travel, and therefore run faster. However, since the GPS clocks are orbiting the Earth at about 3 kilometers per second, they pass laterally through the gravitational field, and thus tick 7,000 nanoseconds slower than stationary clocks. The difference between 46,000 and 7,000 is 39,000 nanoseconds. To offset this figure, engineers reset the GPS clock rates, decreasing them before launch date to 39,000 nanoseconds per day. In this way they can tick at the same rate as the ground clocks, and it can be claimed that the system "works." Van Flandern points out, however, if one uses Einstein's theory, then one would expect that, since the clocks all move very rapidly and with varying speeds relative to the observer on Earth against which the true speed

And later:

> Generally, however, the transmissions arrive at different times. The navigation messages then let the receiver compute the position of each transmission event in the Earth-fixed WGS-84 frame. Before equations can be solved to find the receiver's location, the satellite positions must be transformed to a common Earth-centered inertial frame, since light propagates in a straight line only in an inertial frame.[827]

Although Ashby's presuppositions make him oblivious to it, here we see the reality of absolute space is such a constituent fabric of the universe that the Sagnac effect even occurs in the inner recesses of atoms. Of course, the Relativist chalks this up to "the warping of spacetime" because he simply has no *physical* explanation for what is occurring, so he is forced to change space and time by means of tensor mathematics to mask the physical effects. What he misses is that, if the Sagnac effect is produced in something as small as atoms, then something even smaller is colliding with those atoms, and this is the same reason that Michelson and others had always measured a small positive result in the interferometer experiments. The positive result, as we have seen over and over again, was small enough to escape being explained by the translational motion of the Earth, but large enough to indicate that there was indeed an Earth in the midst of a moving universal medium. The Earth remained in the center of the medium the same as a ship anchored at sea in the eye of a hurricane. This is the position which does not have to appeal to "fixed-Earth" frames merely for "convenience," but because it is, indeed, the state of affairs in the universe. Ashby continues:

> The receiver must then keep track of its own motion during this receiving interval and make appropriate corrections. These

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is measured, relativistic corrections would have to be made on a continual basis, and thus render the GPS non-functional. As it turns out, no such corrections are needed after the GPS are launched. Van Flandern concludes: "They have basically blown off Einstein" (Tom Bethel, "Rethinking Relativity," *The American Spectator*, April 1999). Others, such as Neil Ashby, refute this by reminding critics that, because the GPS have eccentric orbits, they have frequency variations due to varying speeds and heights, which then require a "relativistic" correction (letter on file, Feb. 21, 2005). But Van Flandern's remark is not concerned with "corrections" but with the overall wiring, as it were, of the GPS in ideal conditions.

[827] *Ibid*., p. 8.

> corrections are again proportional to $1/c^2$, that is to say, they are also relativistic ….Historically, there has been much confusion about properly accounting for relativistic effects….In the special case of two inertial frames in relative uniform motion, these are the familiar Lorentz transformations.[828]
>
> Relativistic coordinate time is deeply embedded in the GPS. Millions of receivers have software that applies relativistic corrections. Orbiting GPS clocks have been modified to more closely realize coordinate time. Ordinary users of the GPS, though they may not need to be aware of it, have thus become dependent on Einstein's conception of space and time.[829]

So, once again, we see the convenient "Lorentz transformations," invented in the late nineteenth century specifically for the purpose of avoiding (borrowing GPS terminology) the "Earth-centered, Earth-fixed" implications of the Michelson-Morley experiment. As we noted earlier, they have already pre-programmed the GPS to account for the 50-nanosecond differential and no one is the wiser.

But it is the author's last statement that is even more troublesome. In reality, the only reason people have become "dependent on Einstein's conception of space and time" is that the modern science establishment will entertain no other answers to the Sagnac effect than the tensor calculus and non-Euclidean geometry of General Relativity theory. Even though it is only a theory, it has entrenched itself as the *sine qua non* of the world of physics, and its relativism has seeped deep into the psyche of man. It purports to have been verified by experiment, but the experiments, as one can easily see by reading Ashby's description of the GPS, are merely self-serving opportunities to interpret things as "relativistic." It is uncanny how Relativists have literally stolen experimental facts, which were originally understood and accepted as disproving Relativity, and, by a wave of their mathematical wand, turned them into proofs for the same. In actuality, it is Relativity that avoids the real implications of the Sagnac effect, yet it has the temerity to steal an "Earth-centered, Earth-fixed coordinate system" from geocentrism in order to make its GPS navigable. Life certainly is ironic.

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[828] *Ibid.*, p. 8.

[829] *Ibid.*, p. 10.

Einstein's quest was to make Maxwell's equations work with no ether. This was no small task, since Maxwell's equations depend explicitly on ether. As Herbert Dingle writes:

> …Einstein's relativity theory, designed to save Maxwell's equations, could do so only by sacrificing the ether which was the basis of Maxwell's theory….Einstein, as he said [see pp. 159-60 of Arthur Eddington's *The Mathematical Theory of Relativity*], designed his theory to conform to the Maxwell-Lorentz electromagnetic theory which he accepted as equivalent to "certain."[830]

One of the ironies in this whole escapade of Einstein's resorting to his "relativistic" solution to solve Maxwell's equations is that he knew of another "thought" experiment that employed a non-relativistic solution, but refused to consider using it. As one physicist put it:

> But one can readily construct other thought experiments in which the observables do depend on absolute motions – or that they actually do not require exploitation of the full apparatus developed by Lorentz that gets its final expression in Einstein's theory of relativity. That there were other problematic thought experiments readily at hand had been pointed out clearly by August Föppl (1894)…[831]

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[830] *Science at the Crossroads*, pp. 133, 142. Lorentz was using his "transformation" equations to solve the problems presented by Maxwell's equations, and the Fizeau, Airy and Michelson-Morley experiments. In his work *Versuch* (1895), Lorentz develops his idea of "corresponding states" so that one can transfer back and forth between Maxwell's equations and Fizeau's "partial drag," Airy's stellar aberration, and Michelson-Morley's "null" results of Earth's movement through the ether. In each case, Lorentz, because he assumes the Earth is moving 30 km/sec, must dilate time and shorten lengths to make things fit.

[831] "Einstein's Investigations of Galilean Covariant Electrodynamics Prior to 1905," John D. Norton, University of Pittsburgh, Dept. of History and Philosophy of Science, Jan. 28, 2004, p. 8. Gerald Holton makes a convincing case that Einstein was very familiar with Föppl's arguments but rarely mentioned Föppl's name (*Thematic Origins of Scientific Thought*, pp. 218-225). Föppl based his "thought" experiment on two adjacent charges, at rest and in motion. Norton argues that "The result is that the forces acting and thus the motions resulting would allow a co-moving observer to distinguish whether the pair of charges is moving through the ether or is at rest." In a full appendix he concludes that "the

In order to conceptualize his theory, Einstein created one of his famous *Gedankenexperimenten* (*i.e.*, thought experiments), which reveals keen insights to his thinking process, as well as the connection between Special and General Relativity. In a newly discovered handwritten explanation titled *General Relativity Theory*, he writes:

> According to Faraday, during the relative motion of a magnet with respect to a conducting circuit, an electric current is induced in the latter. It is all the same whether the magnet is moved or the conductor; only the relative motion counts, according to the Maxwell-Lorentz theory. However, the theoretical interpretation of the phenomenon in these two cases is quite different.
>
> The thought that one is dealing here with two fundamentally different cases was for me unbearable. The difference between these two cases could not be a real difference but rather, in my conviction, only a difference in the choice of the reference point. Judged from the magnet, there were certainly no electric fields, [whereas] judged from the conducting circuit there certainly was one. The existence of an electric field was therefore a relative one, depending on the state of motion of the coordinate system being used, and a kind of objective reality could be granted only to the *electric and magnetic field together*, quite apart from the state of relative motion of the observer or the coordinate system. The phenomenon of the electro-magnetic induction forced me to postulate the (special) relativity principle. The difficulty that had to be overcome was in the constancy of the velocity of light in vacuum which I had first thought I would have to give up. Only after groping for years did I notice that the difficulty rests on the arbitrariness of the kinematical fundamental concepts.

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principle of relativity fails for the observables in the case of the two charges" and that "Maxwell's equations (M1) and (M3) are all that is needed to compute the original field and the new magnetic field arising when the charges are set in motion" (pp. 9, 53-54). In his analysis, Föppl admits the insurmountable difficulty of a science which has "no recourse to an absolute motion in space since there is absent any means to find such a motion if there is no reference object at hand from which the motion can be observed and measured." This, of course, is precisely the argument of geocentrism at the core. Föppl holds that the ether "question forms perhaps the most important problem of science of our time" (*Einführung in die Maxwellsche Theorie der Elektrizität*, pp. 307-309, Leipzig: B. G. Tuebner, cited in Holton, *Thematic Origins of Scientific Thought*, pp. 221, 235).

> When, in the year 1907, I was working on a summary essay concerning the special theory of relativity…I had to try to modify Newton's theory of gravitation in such a way that it would fit into the theory [of relativity]. Attempts in this direction showed the possibility of carrying out this enterprise, but they did not satisfy me because they had to be supported by hypotheses without physical basis. At that point, there came to me the happiest thought of my life, in the following form:
>
> Just as is the case with the electric field produced by electromagnetic induction, the gravitational field has similarly only a relative existence. *For if one considers an observer in free fall, e.g., from the roof of a house, there exists for him during his fall no gravitational field – at least in his immediate vicinity.*[832]

We see that the General Theory of Relativity was already in the works as early as 1907, and both it and the Special Theory of Relativity were created by "thought" experiments, with little, if any, physical proof for their validity. The only "proof" Einstein had at his disposal in 1907 was the result of the Michelson-Morley type of experiments that, to his satisfaction, demonstrated that ether did not exist and that the speed of light was constant, the very two ingredients that, according to his above words, Einstein needed in order shore up his theory. As we noted earlier, however, these were merely Einstein's assumptions, or should we say, forced answers, to a problem that could have easily been solved by admitting to a stationary Earth. If Earth was motionless in space, there would be no need to eliminate "absolute rest"; no reason to dispense with a universal medium in space that connects all events (*i.e.*, ether); and no reason to shorten lengths or dilate time.[833]

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[832] "Fundamental Ideas and Methods of Relativity Theory, Present in their Development," Part II, pp. 20-21, translated from the German by Gerald Holton from Einstein's own handwriting, dated circa 1919, italics are Einstein's. Stored in the Einstein Archives at the Princeton Institute for Advanced Study, cited on pp. 381-382 of *Thematic Origins of Scientific Thought*.

[833] Of course, even from a heliocentric perspective, Einstein's theory had its internal contradictions. Herbert Dingle, certainly no sympathizer to geocentrism, shows this quite well: "However, there was an apparent absurdity that did not escape such notice as was taken of the theory, and that was that its two postulates…seemed to contradict, not some independent fact or idea, but each other. If the velocity of light was finite, and there was no ether with respect to which it had that finite velocity, the only apparent alternative was that each beam

Moreover, in the phenomenon Einstein describes concerning the magnet and the conductor, there would be no "relative motion of the observer or the coordinate system," since with a stationary Earth and its stationary space nothing is "relative." All motion and all time, that is, the man falling from his roof as well as the magnet and the conductor, can be measured in absolute terms with a motionless Earth being the universal and unchanging reference point. The ether surrounding Earth serves as the universal conduit for all these events, and thus there is no mysterious Newtonian "action-at-a-distance," but a real time-and-space simultaneity that far exceeds Einstein's limit of the speed of light (we will address the mechanics of simultaneity in subsequent chapters).

The "Observers"

We also see that Einstein invariably employs the "observer" as the ultimate basis for judging these issues, but never reveals that his "observer" is a finite creature with very limited abilities and a confined perspective out of which he has to make such crucial judgments. Further, this "observer" has no foundation upon which to test his judgments against the other "observers" he sees observing. The only thing necessary for Relativity is that the observer has truth in his own little world, and light coming into his retina will magically create this manufactured state of mind for him. Relativists were quite satisfied with this choice. As Eddington put it:

> Newtonian mechanics proceeds on the supposition that there is some super-observer. If he feels a field of force, then that force really exists….It is quite possible that there might be a super-observer, whose views have a natural right to be regarded as the truest, or at least the simplest. A society of learned fishes would probably agree that phenomena were best described from the point of view of a fish at rest in the ocean. But relativity mechanics finds that there is no evidence that the circumstances of any observer can be such as to make his views pre-eminent…the super-observer….I fear that the time has come for his abdication.[834]

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of light had that velocity only with respect to its own source, and this the theory denied" (*Science at the Crossroads*, p. 156).

[834] Arthur Eddington, *Space, Time and Gravitation*, pp. 67-68.

The development from Special Relativity to General Relativity was practically inevitable, for Einstein recognized the flaws in the former quite early. As theoretical physicist Lee Smolin writes:

> Special relativity was the result of 10 years of intellectual struggle, yet Einstein had convinced himself it was wrong within two years of publishing it. He rejected his own theory, even before most physicists had come to accept it, for reasons that only he cared about…Why? The main reason was that he wanted to extend relativity to include all observers, whereas his special theory postulates only an equivalence among a limited class of observers – those who aren't accelerating.[835]

We see that Einstein's reliance on the "observer" finally showed its limitations – something he did not foresee before he invented his theory. In essence, the failure of Special Relativity drove Einstein to invent General Relativity, the ultimate theory in which the phenomenon of acceleration was supposedly answered. Why is acceleration the lynch-pin? Apparently because Einstein believed that in Special Relativity the equivalence principle he treasured so much could be sustained only between a stationary observer and an observer in uniform motion, but not an observer who is accelerating. Special Relativity holds that an observer at rest and an observer in uniform motion will see the light beam moving at the same speed. This equivalence is allowed, says the theory, because the observer in motion will create, by the mere act of moving, a certain space-time path that the light beam will follow towards him. In other words, space and time are adjusted for a moving observer just enough so that he will see the light beam traveling at the same speed as a motionless observer. A motionless observer, of course, will not change the space-time continuum and thus the path of light need not be adjusted for him.

Why, then, was acceleration a problem for Special Relativity? Because the mathematics of Special Relativity did not incorporate the phenomenon of gravity, and since, according to Einstein, gravity and acceleration were phenomenologically equivalent (that is, the observer cannot tell if is he falling in an elevator or accelerating at the same rate in some other place), then Special Relativity did not have an answer for acceleration, and thus it had no way to describe how an accelerated observer would see a light beam. Would the light beam seem to go slower? Some physicists tried to solve this problem for Einstein by reworking the components of Special Relativity, but Einstein rejected them because they infringed on his cherished principle of "equivalence." Without "equivalence" there would be an absolute frame of reference (*i.e.*, the "unthinkable" immobile Earth). In order to preserve equivalence, Einstein had to invent a whole new theory – General Relativity. It was "general" because it was more comprehensive. The General Theory added a very important and needed postulate – that gravity would bend light because it would bend the space in which light traveled. This would serve as the answer to the dilemma, as Eddington put it, since the "Newtonian picture of gravitation as a tug is inadequate. You cannot deflect waves by tugging at them, and clearly another representation of the agency which deflects them must be found."[836] Hence, if there were "equivalence" between gravity and acceleration, then acceleration would also bend light. This now became Einstein's answer to what the accelerated observer would see when he watched a light beam. The faster he accelerates, the more the light beam would bend toward him, for his acceleration creates a proportionate curve of the space-time path that the light beam must follow, and thus, he would see the light beam going the same speed as both the observer at rest and the observer in uniform motion. Mathematically, everything was made to fit. Unfortunately, it was only because of Einstein's misinterpretation of the interferometer experiments that led him to base everything on the speed of light, and which led him to make time and space variable. As Lee Smolin describes it:

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[835] Lee Smolin, *Discover Magazine*, Sept. 2004, p. 38.

> General Relativity is the most radical and challenging of Einstein's discoveries…The theory goes much deeper: It demands a radical change in how we think of space and time…All previous theories said that space and time have a fixed structure and that it is this structure that gives rise to the properties of things in the world, by giving every object a place and every event a time…General relativity is not about adding to those structures…It rejects the whole idea that space and time are fixed at all. Instead, in general relativity the properties of space and time evolve dynamically, in interaction with everything they contain.[837]

The consequences of this theory are profound. Simple values that we use in common experience no longer hold true in Relativity. For example, even the value of π, which is 3.14 on Earth, will be different on Mars and

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[836] Arthur Eddington, *The Nature of the Physical World*, 1929, p. 122.

[837] Lee Smolin, *Discover*, September 2004, p. 39.

Jupiter, and everywhere else in the universe. Partially quoting from Einstein, Charles Lane Poor explains:

> The general result, however, is that "the geometrical properties of space are not independent, but they are determined by matter."….Since the time of Euclid we have been taught to think that for every circle, wheresoever situated, on the Earth, about the sun, near Venus, or in the vicinity of the North Star, the circumference is 3.141592+ times the radius [sic]. Not so in the relativity theory, every gravitational field has its own system of geometry.[838]

Obviously, if everything is relative to its gravitational field, then π is also relative. Using the mathematics of Minkowski's "space-time" and Riemann's non-Euclidean geometry, Einstein could hide the anomalies in complicated tensor formulas. As Arthur Eddington described it:

> But space-time is a four-dimensional manifold embedded in – well, as many dimensions as it can find new ways to twist about in. Actually a four-dimensional manifold is amazingly ingenious in discovering new kinds of contortion, and its invention is not exhausted until it has been provided with six extra dimensions, making ten dimensions in all. Moreover, twenty distinct measures are required at each point to specify the particular sort and amount of twistiness there. These measures are called coefficients of curvature. Ten of the coefficients stand out more prominently than the other ten. Einstein's law of gravitation asserts that the ten principal coefficients of curvature are zero in empty space. If there were no curvature, *i.e.* if all the coefficients were zero, there would be no gravitation. Bodies would move uniformly in straight lines. If curvature were unrestricted, *i.e.* if all the coefficients had unpredictable values, gravitation would operate arbitrarily and without law. Bodies would move just anyhow. Einstein takes a condition midway between; ten of the coefficients are zero and the other ten are arbitrary. That gives a world containing gravitation limited by a law. The coefficients are naturally separated into two groups of ten, so that there is no difficulty in choosing those which are to vanish.[839]

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[838] *Gravitation versus Relativity*, p. 47. Poor meant "times the diameter."

[839] Arthur Eddington, *The Nature of the Physical World*, 1929, p. 120.

Reading between the lines, as it were, we can see that General Relativity's explanation of gravity is nothing more than working backwards from what is already known about the measured force of gravity, and then spreading out those results over twenty "coefficients of curvature." As one author put it: "If written out in full instead of in the compact tensor notation, they would fill a huge book with intricate symbols."[840] With twenty variables at his disposal (courtesy of Riemann), Einstein is bound to reach a mixture that coincides with what we observe of gravity in nature. The theory is very pliable since one can work wonders with mathematics from already-known absolutes. But what it gains in convenience it loses in practical reality. As mathematician Morris Kline sees it:

> …Riemann's 1854 paper convinced many mathematicians that a non-Euclidean geometry could be the geometry of physical space and that we could no longer be sure which geometry was true. The mere fact that there can be alternative geometries was in itself a shock. But the greater shock was that one could no longer be sure which geometry was true or whether any one of them was true…Mathematicians were in the position described by Mark Twain: "Man is the religious animal. He's the only one who's got the true religion – several of them."[841]

So modern man is left with a clear choice. Either π is the same everywhere in the universe and space is space and time is time, and neither is increased, decreased or modified, or Relativity is correct and everything is up for grabs. In Relativity theory it is as if life were a haunted house of mirrors in which no image stays the same. Einstein could not live in a universe where time, space and light were all constant, because, by misinterpreting Michelson's interferometer experiment and consequently rejecting an immobile Earth, he had no universe to accommodate all three as invariables. The only thing absolute for Einstein is his concept of space-time, since, ironically, he dictates that the changes that will occur in such a nebulous dimension are absolute. The way out of this dilemma, however, may be something equally repugnant to modern man: he has to admit that Copernicus was wrong. Adopting an immobile Earth will be the only way of keeping π the same everywhere, for geocentrism is the only way to vanquish Einstein's haunted house of mirrors.

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[840] Banesh Hoffmann, *Albert Einstein, Creator and Rebel*, 1979, p. 122.

[841] Morris Kline, *Mathematics: The Loss of Certainty*, p. 88.

The Failure of General Relativity

Ironically, as Einstein saw the inherent flaws of Special Relativity, he also began to see flaws in General Relativity. The mathematics that seemed so helpful in arriving at two theories that were lacking definitive experimental proof was eventually the same math that showed the inherent anomalies of the theories. For all its muscle in purporting to understand gravity, General Relativity broke down completely in instances where gravity was very strong. Not even a mathematical fudge factor could save it. Consequently, General Relativity led to the phenomenon of black holes – the theoretical vortex where gravity was so strong that not even light could escape its clutches; and without light maintaining its constant speed *c*, Relativity had nothing upon which to hang its hat. Because “space-time” is infinitely “curved” inward in a black hole, all matter within its vicinity, including light photons, is sucked in, eventually leading to the popular but undefined entity called a “singularity,” which, as we take away the cosmetics of language, actually translates into a total contradiction for the theory of Relativity. As physicist Andrei Linde admits:

> A second trouble spot [for the Big Bang] is the flatness of space. General Relativity suggests that space may be very curved, with a typical radius on the order of the Planck length, or 10^{-33} centimeters. We see, however, that our universe is just about flat on a scale of 10^{28} centimeters, the radius of the observable part of the universe. This result of our observation differs from theoretical expectations by more than 60 orders of magnitude.[842]

“Sixty orders of magnitude”? It is unusual for modern periodicals to divulge such gapping holes in the Big Bang universe prophesied by

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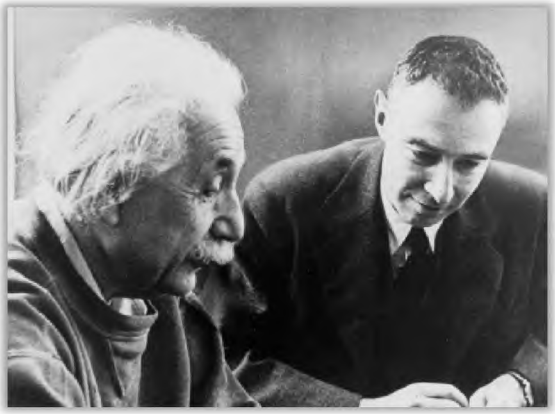
[842] Andre Linde, “The Self-Reproducing Inflationary Universe,” Magnificent Cosmos, *Scientific American*, 1998, p. 99. Linde adds another remarkable observation: “A similar discrepancy between theory and observation concerns the size of the universe, a third problem. Cosmological examinations show that our part of the universe contains at least 10^{88} elementary particles. But why is the universe so big? If one takes a universe of a typical initial size given by the Planck length and a typical initial density equal to the Planck density, then, using the standard Big Bang theory, one can calculate how many elementary particles such a universe might encompass. The answer is rather unexpected: the entire universe should only be large enough to accommodate just one elementary particle – or at most 10 of them. It would be unable to house even a single reader of *Scientific American*, who consists of about 10^{29} elementary particles. Obviously, something is wrong with this theory” (*ibid*).

General Relativity. But what is also not being told to the public about "singularities" is that any object approaching the event horizon of a black hole will grow in mass without limit. Consequently, according to the physics of black holes, it is impossible for any mass to enter a black hole. Objects approaching a black hole must slow down and be refused entry, not accelerate and gain mass.

This was the dead end post of modern cosmology. As *Scientific American* put it: "After all, relativity is riddled with holes – black holes…Clearly the theory is incomplete."[843] *Time* magazine added that black holes were "mere mathematical figments" which "so far can be shown only as solutions to the complex equations of general relativity – and very troubling solutions at that."[844] According to his colleague John Moffat:

> Einstein didn't like black holes. The real motivation for "generalizing" his gravity theory was to see if he could find, as he called them, "everywhere regular solutions" that fit the equations.[845]



Thus, it was Einstein's quest to eliminate black holes altogether. In 1939 he published an article in *Annals of Mathematics* arguing that black holes would not be formed by the collapse of a star, but the record shows he was thoroughly unsuccessful. A few months later Robert Oppenheimer and Hartland Snyder corrected Einstein's math, concluding that black holes do, in fact, exist in Relativity theory. This once again shows how mathematics can be shaped to provide evidence for two diametrically opposed theories.

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[843] George Musser, "Was Einstein Right?" *Scientific American*, Sept. 2004, p. 89. Hawking adds: "Thus, general relativity brings about its own downfall by predicting singularities" (*Black Holes and Baby Universes*, p. 92).

[844] *Time*, "Those Baffling Black Holes," September 4, 1978, pp. 56-62.

[845] Tim Folger, "Einstein's Grand Quest for a Unified Theory," *Discover*, September 2004, p. 64.

The battle between **Einstein and Oppenheimer** is a *Catch-22* situation for Einstein's followers, for if black holes do not exist (and they have never been proven, experimentally, to exist)[846] then there is no ultimate proof for the existence of General Relativity (since the theory predicts they must exist); but if black holes do exist, then General Relativity brings us to a dead end in understanding gravity and the universe at large, since in these "singularities" the laws of physics totally break down. In a singularity gravity becomes a repulsive force rather than an attractive force. Thus, a trap has been set for Relativistic physics out of which there is no escape. Perhaps if these physicists would cease creating universes merely out of mathematical preferences and begin depending on verified experimental evidence, they would at least come to some semblance of truth as to how the universe is constructed. One author put it:

> Mathematics should be used to describe the operation of models, not to build them…equations cannot be made to substitute for the concepts which underlie them. And equations are generally blind to limitations of range and physical constraints. They are too general, and simply lack the sort of specificity that true, intuitive understanding demands. Every equation has a domain of applicability – usually the range of the observations and little, if anything, more…If an equation can be extrapolated outside its domain and gives a singularity (basically, a zero divisor), that singularity does not exist in nature; instead, the model needs modification. Up to now this rule has always proved true. But advocates of "black holes" in the universe would have us believe that the equations which predict them can be relied upon far outside the domain of the observations used to derive those equations.[847]

Others go behind the mystique of General Relativity and show that it is merely a repackaging of old ideas in new mathematics. Reginald Cahill writes:

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[846] See Stephen Crothers interview at http://www.youtube.com/watch?v=fsWKINfQwJU

[847] Van Flandern, *Dark Matter, Missing Planets and New Comets*, 1993, p. xxi.

> It has been repeatedly claimed that the Hilbert-Einstein General Theory of Relativity has been confirmed many times, but this is untrue. All but one of the so-called tests merely used the geodesic equation which determines the trajectory of a particle or an electromagnetic wave in a given metric; that metric has in all cases been the external Schwarzschild metric, but apparently unknown to most is that this metric is nothing more than the Newtonian 'inverse square law' in mathematical disguise, namely, with the metric expressed in terms of the particular velocity vector flow field corresponding to Newton's inverse square law. So these tests of GR were confirming, at best, the flow formalism for gravity, together with its geodesic equation, and had nothing to do with the dynamical content of GR.[848]

As we can easily see, reality is far different from Einstein's pliable world of mathematics. By giving us knowledge of an immobile Earth, the "Good Lord"[849] shows us not only that heliocentrism and relativity are wrong, but that, as the celestial bodies revolve around the Earth, we are to use them to keep track of space and time. That being the case, we know they are accurate.[850] God, of course, also knows the absolute universal time, and gives us clear indications that such precision not only exists, but that this timetable is shared between the divine world and the human world.[851] The sun, moon and stars were placed in the cosmos as timekeepers (Genesis 1:14-18), and they are so accurate that if one wants to know the beginning day of creation he only needs to count back three twenty-four hour days and he will know the exact time that the Earth was "without form and void" on the First Day of creation. Similarly, by means of the firmament we can understand the existence of absolute space. Space is not "curved," it is linear, just as we see on Earth.[852] Whenever a Relativist says: "space is curved," this merely begs the question: "Curved in relation to what?" If the Relativist says: "time slows down," we respond: "Slows down in relation to what?" If he says that he has a "preferred frame of reference" we ask "what frame, and in reference to what?" Every proposition a Relativist utters assumes there is an absolute against which he can measure his proposition. To put it another way, the whole theory of Relativity, ironically, is based on the assumption that something is at rest. Even if he says "the speed of light is my absolute," we respond: "the speed of light in relation to what?" And if he is someday so bold as to assume he has a "what," we are still going to ask him "what in relation to what?" and thus require him to prove his "what" over against any other possible "whats." If he says, "the universe is at rest" then he is once again on our side, since he has already admitted there is no difference between a rotating Earth in a fixed universe as opposed to a fixed Earth in a rotating universe.[853] God has sprung a trap for modern man, and Relativity is its name.

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[848] Reginald T. Cahill, *Novel Gravity Probe B Gravitational Wave Detection*, School of Chemistry, Physics and Earth Sciences, Flinders Univ., Australia, August 21, 2004, p. 4.

[849] "The Good Lord" was the term Einstein used when he was confronted with the uncertainties of Quantum Mechanics, stating: "the Good Lord did not play dice with the universe" (*Einstein: The Life and Times*, p. 414).

[850] Genesis 1:14-17; Psalm 104:19; Sirach 43:6.

[851] "All things are the works of the Lord…and whatever he commands will be done in his time. No one can say, 'What is this?' 'Why is that?' for in God's time all things will be sought after" (Es 39:16-17); "…for he has appointed a time for every matter, and for every work" (Ec 3:17); "But thou hast arranged all things by measure and number and weight" (Ws 11:20); "And he made from one every nation of men to live on all the face of the Earth, having determined allotted periods and the boundaries of their habitation" (Ac 17:26), *cf.*, Gn. 7:10; 8:10; 18:14; 21:2; Ex 9:5; 12:40; Lv 25:8; Js 10:10-12; Jb 14:5; Ps 119:90-91; Jr 33:20; Dn 2:21; 8:14; Mt 20:3-6; 24:36; 26:45; 27:45; Lk 22:59; Jn 1:48; 4:52-53; 13:1; Ac 1:7; 17:26; Gl 4:4; 1Tm 2:6; Ap 8:1; 9:15; 11:2-3, 11; 12:6; Es (Sr) 48:23; Ws 8:8; 33:8.

Conversely, by the record of meticulous genealogies and chronologies in Holy Writ we know from whence our beginnings occurred. Unfortunately, since the world has been deceived into thinking that the Earth is moving, it is forced to resort to all the contortions and hypotheticals in Einstein's foregoing paragraphs. God gave mankind a fixed Earth precisely so we would not be forced into such contortions. The immobile Earth gives us the surest foundation from which to measure the rest of the universe. If the Earth is fixed, we can find the position and distance of any point in the universe by triangulation. Even if we were situated in some remote part of the universe and couldn't see the Earth, we could still determine location based on previous triangulations from positions that had seen the Earth. Moreover, once we assume a fixed Earth, we can take the *ad hoc* Lorentz transformations out of all physics equations. If present-day physicists, astrophysicists and astronomers would accept this one crucial premise, they could solve most, if not all, the mysteries they see in the universe. As Scripture testifies boldly:

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[852] Genesis 1:6-9; 14-17; Psalm 19:1; 150:1; Sirach 43:1, 8.

[853] Take, for example, Eddington's explanation of gravity by means of radial curvature. He writes: "The radius of spherical curvature of every three-dimensional section of the world, cut in any direction at any point of empty space, is always the same constant length." Two pages later Eddington admits: "There is no such thing as absolute length; we can only express the length of one thing in terms of the length of something else." Yet Eddington fails to explain how he knows the length of the "something else." (*The Nature of the Physical World*, 1929, pp. 139, 141). In another place he admits: "Our simple solution has been to give up the idea that one of these is right and that the others are spurious imitations, and to accept them *en bloc*; so that distance, magnetic force, acceleration, etc., are relative quantities, comparable with other relative quantities already known to us such as direction or velocity. In the main this leaves the structure of our physical knowledge unaltered; only we must give up certain expectations as to the behaviour of these quantities, and certain tacit assumptions which were based on the belief that they are absolute" (*ibid*, p. 35).

> Tremble before him, all the Earth; he has made the world firm, not to be moved….Through all generations your truth endures; fixed to stand firm like the Earth….But you have disposed all things by measure and number and weight…Indeed, before you the whole universe is as a grain from a balance, or a drop of morning dew come down upon the Earth. But you have mercy on all, because you can do all things; and you overlook the sins of men that they may repent.[854]

Unfortunately, modern man has a distaste not only for divine revelation but for physical absolutes, for they invariably translate into moral and ethical absolutes, and eventually they lead to the one Absolute to whom man refuses to bow.

More Trouble Ahead

The anomalies and contradictions in Relativity are endless. For all Einstein's remarks about dispensing with ether, we find him having to support a similar concept in order to help his General Relativity theory pan out. He writes:

> According to the general theory of relativity space is endowed with physical qualities; in this sense, therefore, there exists an ether. According to the general theory of relativity space without ether is unthinkable; for in such space there would not only be no propagation of light, but also no possibility of existence for standards of space and time (measuring rods and clocks), nor

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[854] A scriptural medley taken from 1 Chronicles 16:30; Psalm 119:90; Wisdom 11:20 (NAB).

> therefore any space-time intervals in the physical sense. But this ether may not be thought of as endowed with the quality characteristic of ponderable media, as consisting of parts which may be tracked through time. The idea of motion may not be applied to it.[855]

So Einstein gets to have his cake and eat it, too. As he once used mathematics, he now twists and turns language itself to get to the position that will make his theory work. Knowing that he cannot escape the concerns of Newton, Maxwell and the pre-Michelson-Morley physics establishment, Einstein resigns himself to accepting that some kind of ether exists, and thus it must have enough "physical qualities" so that it can "propagate light" and serve as the "standard…for measuring rods and clocks…and time intervals in the physical sense," but by some as yet unproven premise we are assured by the same course of logic that such a versatile substance is not "ponderable," has no "parts," and has no "time." What an amazing world Einstein created for himself. Of course, avowed Relativists just shirk off such paradoxes by claiming that the rest of us "just don't understand the theory," but it should be quite apparent by now that this excuse has joined the ranks of those viewing the emperor and his new clothes.

In that light, perhaps these words from Einstein will now make more sense: "When I examine myself and my methods of thought I come to the conclusion that the gift of fantasy has meant more to me than my talent for absorbing positive knowledge"[856] Or perhaps the following will shed even more light:

> Nature is the realization of the simplest conceivable mathematical ideas. I am convinced that we can discover, by means of purely mathematical constructions, those concepts and those lawful connections between them which furnish the key to understanding of natural phenomena. Experience may suggest the appropriate mathematical concepts, but they most certainly cannot be deduced from it. Experience remains, of course, the sole criterion of physical utility of a mathematical construction. But the creative principle resides in mathematics. In a certain

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[855] Albert Einstein, "Geometry and Experience," in *Sidelights on Relativity*, 1983, p. 30, cited in *De Labore Solis*, p. 65.

[856] *Einstein: The Life and Times*, p. 118.

> sense, therefore, I hold it true that pure thought can grasp reality, as the ancients dreamed.[857]

Consequently, from this point onward, everything gets very complicated and confusing in Relativity theory, for it must answer questions about which it simply could not find logical solutions.[858] As Dingle puts it:

> First, the facts show, I think beyond question, that the traditional proud claim of Science that it acknowledges the absolute authority of experience (*i.e.*, observation and experimentation) and reason over all theories, hypotheses, prejudices, expectations or probabilities, however apparently firmly established, can no longer be upheld…instead of enabling the full implications and potentialities of the fact of experience to be realized and amplified, it has been held necessarily to symbolize truths which are in fact sheer impossibilities but are presented to the layman

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[857] *Thematic Origins of Scientific Thought*, p. 252.

[858] Some of these include the following items, some of which have already been addressed in the main body of this volume: (1) how to determine which clock ticks more slowly, A or B, when both are in uniform relative motion (*cf.*, *Science at the Crossroads*, Herbert Dingle, Western Printing, 1972, p. 81); (2) how a person traveling 99% the speed of light could never get one fraction closer to a light particle traveling ahead of him, and in fact, the light particle would continue to *increase* its distance from the person by 300km/sec (*The Einstein Myth and the Ives Papers*, Part 1, p. 3); (3) the decrease in light's measured speed over the course of 150 years (*cf.*, experiments with quasar light, August 2002, *Nature*, Paul Davies (winner of the 2002 Michael Faraday prize) from Macquarie University, Australia; *Science* 1927; *Nature* 1934 citing M. Gheury de Bray in *L'Astronomie*, which showed by statistics since 1849 that light was slowing down by four kilometers per second every year; (4) experiments in which light reacts faster than *c* (*cf.*, Lijun Wang at NEC Research Institute, Princeton, where light was made to travel 300 × *c*; (5) xenon experiments showing light's speed being dependent on its source (*cf.*, 1962, *New Scientist* (16:276) citing W. Kantor of the US Navy Electronics Laboratory in the *Journal of the Optical Society of America* (vol. 52, no. 8, p. 978); (6) the ability of photons to correlate their movements even when separated by time and distance (*cf.*, 1982, John Stewart Bell experiment conducted at the Institute of Theoretical and Applied Optics, Paris; (7) how to explain rotation. For example, it is known that signals from a Global Positioning Satellite (GPS) approaching a ground station arrive 50 nanoseconds less than a GPS receding from the ground station, and thus the constancy of the speed of light seems not to hold. The same effect was demonstrated by Georges Sagnac in 1913 and predicted by Albert Michelson (See section on Sagnac in Chapter 5).

> as discoveries which, though they appear to him absurd, are nevertheless true because mathematical inventions, which he cannot understand, require them….the theory of relativity is believed to be so abstruse that only a very select body of specialists can be expected to understand it. In fact this is quite false; the theory itself is very simple, but it has been quite unnecessarily enveloped in a cloak of metaphysical obscurity which has really nothing whatever to do with it.[859]

Ironically, Relativity did not have the adherents it sought, at least prior to the famous 1919 eclipse photographs of the bending of starlight near the sun produced by Arthur Eddington, which is a story in itself (see Volume II: "Einstein: Everything is Relative"). Prior to 1919, most of the major players in physics either rejected or did not fully embrace Relativity. Ernst Mach rejected it outright. Henri Poincaré never publicly supported Einstein in print. Henrick Lorentz encouraged Einstein, but never fully embraced Relativity. Walter Ritz, who at first collaborated with Einstein, expressed his doubts about Special Relativity as early as 1909.[860] Max

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[859] Herbert Dingle, *Science at the Crossroads*, pp. 12-13, 16. Due to his opposition to Einstein, until his death, Dr. Dingle was shunned by the press and was consistently denied publication of his papers in the prestigious periodicals, *Nature* and *Science*. After many appeals, *Nature* finally published Dingle's critique of Einstein (*Nature*, 195, 985 (1962); and 197, 1287 (1963)). As Dingle writes, his efforts "received only one reply from an acknowledged authority, namely, Professor Max Born…". Born did not deny Dingle's critique of Einstein, but only said it was not expressed clearly. Dingle continues: "It is understandable that there should be hesitation in believing that a theory so firmly established, and apparently supported by a great weight of evidence, should be disproved as simply as my letter suggested, but it is equally hard to believe that, if such a simple disproof contained a fallacy, no exposure of that fallacy (which, it may be added, there have been numerous private but unsuccessful attempts to extract from recognized authorities), should have been forthcoming. This criticism of the theory, in various forms, has been published repeatedly, during a period of almost nine years, in physical, astronomical and philosophical journals and in four books, in Britain and in America, without eliciting a single published comment. Reluctance to correct errors in such matters is not a customary feature of scientific discussion, so the natural inference is that there is here no error to correct" (*Science at the Crossroads*, p. 228).

[860] W. Ritz, *Annales de Chimie et de Physique*, vol. 13, 145 (1908). Just prior to Ritz's death, he and Einstein published an account of their controversies concerning their respective relativity theories (W. Ritz and A. Einstein, *Physique Zeitschrift* 10, 323, 1909). Ritz's contentions with Einstein were especially regarding the issues surrounding absolute motion and the emission theory of light.

Planck, although he accepted Special Relativity, rejected General Relativity. Ernest Rutherford called it "nonsense."[861] Frederick Soddy said it was an "arrogant swindle," and "an orgy in amateur-physics."[862] Albert Michelson, who performed one of the very experiments that led to Einstein's theory, said he was sorry that his work may have had a part in creating such a "monster."[863] Finally, as he found himself shifting back and forth in the maze created by Einstein, one day supporting him, the next day entertaining doubts, in one of his more somber moments, Arthur Eddington stated:

> For the reader resolved to eschew theory and admit only definite observational facts, all astronomical books are banned. There are no purely observational facts about the heavenly bodies. Astronomical measurements are, without exception, measurements of phenomena occurring in a terrestrial observatory or station; it is only by theory that they are translated into knowledge of a universe outside.[864]

Ritz's hypothesis was supposedly disproved by the Alväger, Nilsson, Kjellman experiment when gamma radiation with spectrum shifts traveled at the same velocity as beams from particles showing no spectrum shift, but as Dingle writes: "But suppose the beams had traveled with different velocities. Then the electromagnetic theory would have been disproved, and so the evidence that the sources were particles moving with the supposed velocities would have disappeared. Such an experiment therefore could not possibly have tested Ritz's hypothesis" (*Science at the Crossroads*, p. 234). See also Walter Kaufmann's 1906 experiment (fn. 52), which is evaluated by Ritz in the above publication *Annales de Chimie*, that helped determine the nature of the electron and thus deny the validity of the Lorentz-Einstein theory, at least until Max Planck helped to revive it. (For an in-depth analysis of the Ritz-Einstein controversy, see John D. Norton's, "Einstein's Investigations of Galilean Covariant Electrodynamics Prior to 1905," University of Pittsburgh, Dept. of History and Philosophy of Science, rev. Jan. 28, 2004, pp. 12-22).

[861] Quoted in the *Economist*, provided by Martin Gwynne. Herbert Dingle adds: "Lord Rutherford…could be more accurately described as scornful rather than as critical of the relativity theory" (*Science at the Crossroads*, p. 96).

[862] "The Wilder Aspects of Atomic Disintegration," *New World Pub.* St. Stephens House, Westminster S. W. I, 1954.

[863] R. S. Shankland, "Conversations with Einstein," *American Journal of Physics*, 31:56, 1963, cited in *Thematic Origins of Scientific Thought*, pp. 249, 270.

[864] Quoted in *Cosmology*, by Edward R. Harrison, 1981, p. 226, cited in *De Labore Solis*, p. 44.

As the saga continues, the problems mount for Einstein. He needs some kind of evidence that gravity bends light (and in the exact amount that Relativity predicts), and he also needs evidence that there is no absolute motion and no ether, otherwise, his "thought" experiments will remain just that – thoughts. This is why the Michelson-Morley experiment becomes extremely important to him, as it does for everyone else in the Relativistic camp, both then and now, for it will be the only "proof" for a long time to come. It is the same reason the Michelson-Morley experiment, and its dozens of repetitions over the years, have attained such popularity in the literature of modern physics. In retrospect, the Michelson-Morley experiment would determine, once and for all, whether Maxwell's equations were true in the observer's frame of reference, and thus show whether that particular frame was moving or not. Naturally, if one is moving through a medium, the wave he observes will vary depending upon the direction he is moving.

However, since the observer is on Earth, a null result to the Michelson-Morley experiment would offer the distinct possibility that the Earth was not moving. Of course, that solution would not be accepted. Science had to search for another solution – one that could save Maxwell, Copernicus and Galileo, and the face of modern science. Arago's, Hoek's and Airy's experiments had already shown that Michelson-Morley should give a null result, but the powers-that-be insisted on checking it again and again because they simply couldn't believe what their eyes were telling them. But since science could not change the results, it chose to believe that the Earth's motion could not be detected in the ether rather than accepting that the Earth was not moving in an ether, and therefore it concluded that Maxwell's equations will work in any inertial frame and are not dependent on ether. Lorentz added the "transformation" equations, which shortened the lengths and the time of objects going through ether. All was well, at least for a while.

Galileo Was Wrong
The Church Was Right

The Evidence from Church History

Volume III

Chapters 14 - 17

Seventh Edition

Robert A. Sungenis, Ph.D.

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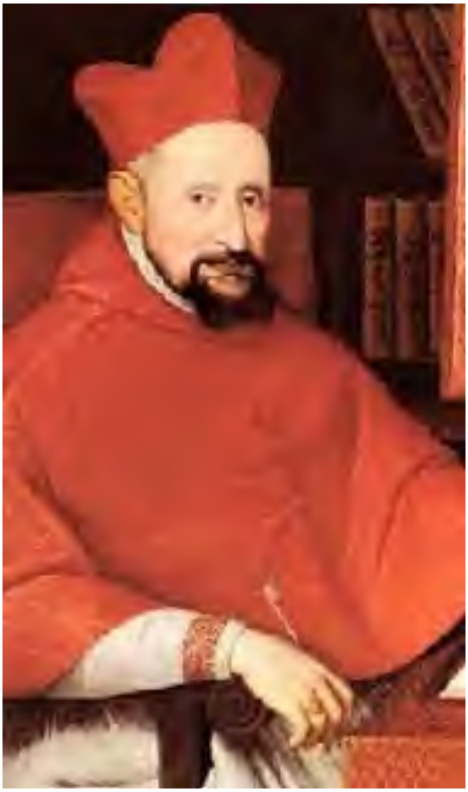
For their courage and foresight in standing up
to the unproven theories of Galileo Galilei



Roberto Card.le Bellarmino

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Scripture Abbreviations

New Testament

Mt	Matthew
Mk	Mark
Lk	Luke
Jn	John
Ac	Acts
Rm	Romans
1Co	1 Corinthians
2Co	2 Corinthians
Gl	Galatians
Ep	Ephesians
Ph	Philippians
Cl	Colossians
1Th	1 Thessalonians
2Th	2 Thessalonians
1Tm	1 Timothy
2Tm	2 Timothy
Ti	Titus
Pm	Philemon
Hb	Hebrews
Jm	James
1Pt	1 Peter
2Pt	2 Peter
1Jn	1 John
2Jn	2 John
3Jn	3 John
Jd	Jude
Ap	Apocalypse (Revelation)

Old Testament

Gn	Genesis
Ex	Exodus
Lv	Leviticus
Nm	Numbers
Dt	Deuteronomy
Js	Joshua
Jg	Judges
Rt	Ruth
1Sm	1 Samuel
2Sm	2 Samuel
1Kg	1 Kings
2Kg	2 Kings
1Ch	1 Chronicles
2Ch	2 Chronicles
Er	Ezra
Nh	Nehemiah
Tb	Tobit
Jt	Judith
Et	Esther
1Mc	1 Maccabees
2Mc	2 Maccabees
Jb	Job
Ps	Psalms
Pr	Proverbs
Ec	Ecclesiastes
Sg	Song of Solomon
Ws	Wisdom
Es	Ecclesiasticus (Sirach)
Is	Isaiah
Jr	Jeremiah
Lm	Lamentations
Br	Baruch
Ez	Ezekiel
Dn	Daniel
Hs	Hosea
Jl	Joel
Am	Amos
Ob	Obadiah
Jh	Jonah
Mc	Micah
Na	Nahum
Hk	Habakkuk
Zp	Zephaniah
Hg	Haggai
Zc	Zechariah
Ml	Malachi

For the wrath of God is revealed from heaven against all
ungodliness and wickedness of men who by their wickedness
suppress the truth.

For what can be known about God is plain to them,
because God has shown it to them.

Ever since the creation of the world his invisible nature,
namely, his eternal power and deity, has been clearly
perceived in the things that have been made.
So they are without excuse;

for although they knew God they did not honor him as God or
give thanks to him, but they became futile in their thinking and
their senseless minds were darkened.

Romans 1:18-21

"But more dangerous is the error of certain weak brethren who faint away when they hear these irreligious critics learnedly and eloquently discoursing on the theories of astronomy or on any of the questions relating to the elements of this universe. With a sigh, they esteem these teachers as superior to themselves, looking upon them as great men; and they return with disdain to the books which were written for the good of their souls; and, although they ought to drink from these books with relish, they can scarcely bear to take them up."

St. Augustine[1]

"Such as?" Her tone was mean and abrupt. A rush of argument broke from Slote, as though he wanted to conquer her with words in Byron's presence, if he could do nothing else. He began stabbing one finger in the air, like exclamation points to his sentences. "Such as, my dear, that Christianity is dead and rotting since Galileo cut its throat."

Slote[2]

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[1] *The Literal Meaning of Genesis*, Book 1, Chapter 20, Para. 41, *Ancient Christian Writers*, *ibid*., p. 44.

[2] The words of Slote to Natalie to prove the philosophical basis (as opposed to the economic basis) for the impetus to the 20th century German revolution (Herman Wouk, *The Winds of War*, Pocket Edition, 1973, p. 610).

"If I have spoken to you earthly things, and you believe not; how will you believe if I shall speak to you heavenly things?"

Jesus Christ[3]

"The person who thinks there can be any real conflict between science and religion must be either very young in science or very ignorant of religion."

Joseph Henry[4]

"If God had spoken scientifically, even an Einstein would not have understood him."

Walter van der Kamp[5]

"It follows from this that our notions of physical reality can never be final. We must always be ready to change these notions."

Albert Einstein[6]

---

[3] John 3:12.

[4] Joseph Henry, American physicist (d. 1878), attributed, not verified.

[5] *Bulletin of the Tychonian Society*, December 1981, p. 17.

[6] Albert Einstein, *Ideas and Opinions*, p. 266.

But God chose what is foolish in the world to shame the wise,
God chose what is weak in the world to shame the strong,

God chose what is low and despised in the world, even things that are not, to bring to nothing things that are,

so that no human being might boast in the presence of God.

1 Corinthians 1:27-29

Introduction

If you have read the first two volumes of *Galileo Was Wrong: The Church Was Right*, you are now ready to tackle volume three. As was the case with the science, in the historical issues concerning Galileo the data is plentiful but the correct interpretation is almost always lacking. Galileo historians, entrenched in the Copernican Principle, view the history through filtered lenses. Some of the names that control the dialogue on this topic are: Father George Coyne S.J., Cardinal Paul Poupard, Maurice Finocchiaro, Ernan McMullin, Annibale Fantoli, Pierre-Noël Mayaud, Stillman Drake, Guy Cosolmango, Richard Westfall, Richard Blackwell, Pietro Redondi, and a few others. Although all the major Catholic Galileo scholars are guilty of a Copernican bias, perhaps Pierre-Noël Mayaud stands out as one of the better examples. His bias is clear when he includes in his analysis that he accepts all the popular "proofs" of heliocentrism before he does his analysis of the historical events. He writes:

> For internal proofs we understand the synthesis of Newton, which was constantly clarified and made perfect during the 18th century. He showed reason for the relative movements of different bodies of the solar system by integrating in particular Kepler's three laws, apparently purely empiric, while completing this by a prestigious theory of the tides, a necessary consequence of the universal gravitation. One should add, as a necessary condition of this synthesis, the first exact measurement of the solar parallax in 1672, opening the way to the true knowledge of the solar system's dimensions, and in particular of the enormous mass of the sun in relation to that of the planets. This is the condition of stability of the whole, which would render it inconceivable that the sun would turn around the earth. Concerning the external proofs, there is first of all the discovery of the variation of the pendulum's length in variation of the width, beating the seconds, the first indication of the daily rotation of the earth, then, with Bradley, the discovery of the aberration of the fixed stars with indication of the annual revolution, and finally the measurement of the terrestrial spheroid's flatness, indicating again in that sense the daily rotation, and last not least the observation of comet Halley's return, which was a striking confirmation of the Newtonian

> Synthesis. All this has been more or less repeated by Olivieri in his developing work, while we are recalling that these proofs are after the decrees of 1616 and 1620. This last point is also expressed in an implicit manner in the ‘posterioza observata’ of the second paragraph of the decree of August 16, 1820. Let us add that Olivieri often mentions as external proof the discovery of the air gravity by Torricelli, which is contrary to the Aristotelian Concept of the light weighing element. It permits to understand how the air is affected by the earth’s rotation. This proof exists nevertheless in the rank of a response to the physical objections against the possibility of the earth’s rotation.[7]

Suffice it to say, all of these so-called “proofs” have been discredited, but few, if any Catholic scholars either have the scientific acumen to understand them or are privy to the scientific evidence that does so. Another example is Annabale Fantoli in his new book *The Case of Galileo: A Closed Question*? He writes:

> This new Newtonian physics had finally given a full theoretical justification of the Copernican system, perfected upon the basis of the three laws of Kepler. Any form of geocentrism, including that of Tycho Brahe, had thus been excluded. And they in 1728, the discovery of the phenomenon of the aberration of starlight…had furnished the first geometrical argument in favor of the Earth’s movement about the Sun….And so we have that which Bellarmine himself had admitted…that is, the necessity to reexamine the interpretation of scriptural passages regarding the motion of the Sun and the stability of the Earth. In the face of incontestable physical proofs to the contrary, this could no longer be ignored by the Roman authorities. On the other hand, there was still the decree of the Index of 1616 and the condemnation of Galileo by the Holy Office in 1633. To officially accept the Copernican view now would imply openly acknowledging a mistake on the part of the Church. And this, in the ecclesiastical atmosphere of the epoch, was simply unthinkable.[8]

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[7] *The Condemnation of Copernican Books and its Repeal* for the Gregorian University of Rome in 1997, translated from the French from p. 255, footnote #36.

[8] Annabale Fantoli, *The Case of Galileo: A Closed Question*?, trans. By George V. Coyne, SJ, University of Notre Dame Press, 2012, p. 220.

It is rather interesting to see Fantoli use the word "unthinkable." Obviously he believes science has proven the Copernican theory. It is the lens through which he views the whole Galileo affair; and it results in Fantoli believing he is more knowledgeable than the Church, not only on the Galileo issue but also with various social and moral issues. It is the very reason that later in his book he faults the Church for her doctrine on contraception and insists that, due to her mistake with Galileo (which he calls "an abuse of power both doctrinal and disciplinary"),[9] the Church should make herself "more open to the world."[10] But Fantoli's realizes, nonetheless, that the Church considers herself guided by the Holy Spirit who cannot lie, and thus it would be "unthinkable" for her to even consider she made a mistake in condemning Galileo and heliocentrism.

Let's put the shoe on the other foot. "Unthinkable" was the word Einstein's biographer, Ronald Clark, employed to describe the conundrum of modern science when the 1887 Michelson-Morley experiment found direct evidence that heliocentrism could not be demonstrated and that the Earth appeared, indeed, to be motionless in space, even as the Church had maintained for her entire history. Clark writes:

> In the United States Albert Michelson and Edward Morley had performed an experiment which confronted scientists with an appalling choice…leaving science with the alternatives of tossing aside the key which had helped to explain the phenomena of electricity, magnetism, and light of deciding that the earth was not in fact moving at all….For there seemed to be only three alternatives. The first was that the earth was standing still, which meant scuttling the whole Copernican theory and was *unthinkable*.[11]

As we see, what Fantoli saw as unthinkable for the Church to admit, could, in actuality, be unthinkable for modern science to admit. It was so unthinkable that Einstein invented his Special Relativity theory to make it appear as if the Earth was moving when the scientific evidence showed, *prima facie*, it was standing still. Fortunately or unfortunately, the Church doesn't have such options. It stands or falls on its tradition and its official teaching, which cannot change.

Opposed to Mayaud and Fantoli, sometimes we see a more fair-minded and less biased voice, such as Father Walter Brandmüller, president of the Pontifical Committee for Historical Sciences, who recently wrote in his book, *Light and Shadows: Church History Amid Faith, Fact and Legend*, the following stark admission: “Furthermore, the most recent scientific findings vindicate the Church of 1633.”[12] What!? We actually have a high-placed cleric of the modern Church saying that the Catholic Church of the seventeenth century was right in condemning Galileo and heliocentrism! Father Brandmüller is indeed a rare breed at the Vatican. We only wish he had not been so laconic in revealing this information, since a detailed explanation of how he came to this rather astounding conclusion would have had the most profound effect on how the rest of the world should view the Galileo case and the Catholic Church at large, especially coming from a man with as high an ecclesiastical position at the Vatican that he possesses.

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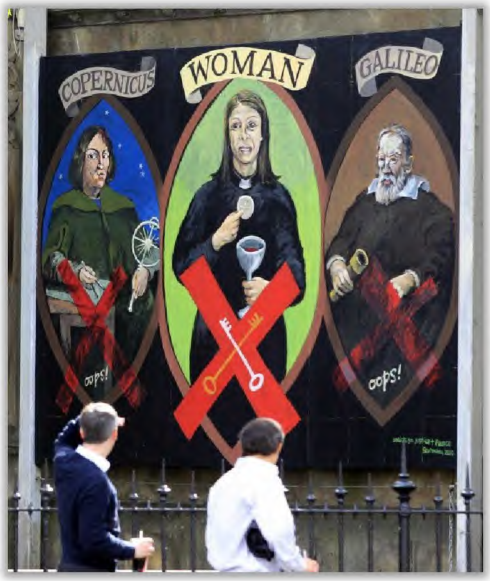
[9] *Ibid*. p. 120.

[10] *Ibid*., pp. 252-253.

[11] *Einstein: The Life and Times*, 1984, pp. 57, 110.

As noted, such voices are rare from Catholics these days. Most harbor biased and uneducated views on the topics of cosmology and cosmogony. Whenever science issues rise for discussion, Catholics, in a word, ‘are fearful of making the same mistake the Church made with Galileo,’ and forthwith decide to leave science and its interpretation to those in the secular fields. It is precisely why Annibale Fantoli uses the Church’s presumed mistake with Galileo as his cudgel for expressing his disdain for the Church’s doctrine against contraception.



On a trip to Scotland a few years ago, Pope Benedict XVI was confronted by a mural on a city wall depicting a woman dressed as a priest and flanked on either side by Galileo and Copernicus with the word “oops!” at the bottom of each picture. The message was clear: as the Church is presumed to have made a mistake in condemning heliocentrism, she is also presumed to have made a mistake in barring women from the priesthood. In fact, everything from homosexuality, divorce, remarriage, contraception, abortion, genetic engineering to cloning, the Catholic Church has been relentlessly stigmatized as a primitive and out-of-touch institution in the modern age, beginning with her mistake concerning Galileo, which she now carries over into every other area of life. The complaint is often heard: 'How can the Catholic Church claim to be infallible when, in fact, she put the weight of the magisterium behind her traditional interpretation of Scripture in order to condemn Galileo and his heliocentric system, yet we now know she was totally wrong?' This seems to be a legitimate question. If the Catholic Church was wrong about what she not only claimed to be right, but also claimed that she had sole authority to judge, how could we ever trust her to handle even more complex issues?

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[12] Walter Brandmüller, *Light and Shadows: Church History amid Faith, Fact and Legend*, Ignatius Press, 2009. Original German edition, 2007, p. 13. Brandmüller was professor of Church history at the University of Augsburg, Germany, from 1970 to 1997.

L'OSSERVATORE ROMANO

GIORNALE QUOTIDIANO POLITICO RELIGIOSO

Al concilio pieno di entusiasmo e speranza

Quando il cardinale di Colonia Joseph Frings ebbe paura di perdere la porpora per un testo sul concilio scritto per lui dal giovane teologo Joseph Ratzinger

La decisione dei padri di non votare subito le liste già pronte dei membri delle commissioni non fu un atto rivoluzionario ma un gesto di coscienza e di responsabilità Siamo noi il soggetto — dicono — e vogliamo fare le nostre scelte

L'Osservatore Romano, February 14, 2013

Of course, it doesn't help the Church to dispel these secular taunts when its own vicar of Christ reveals that one of the main reasons for the initiation of Vatican Council II was because of "the error of the Church in the case of Galileo Galilei," which "error" then led Vatican II's prelates to believe they needed to "correct this wrong beginning and find the union between the Church and the best forces in the world in order to open up the future of humanity, to open true progress." The context of Pope Benedict's words are as follows:

> So we went to the Council not only with joy, but with enthusiasm. There was an incredible anticipation. We hoped that everything would be renewed, that a new Pentecost would truly come, a new era of the Church – because at that time, the Church was still strong enough: Sunday practice still good, the vocations to the priesthood and to religious life were already a bit reduced but still sufficient. Nonetheless, we felt that the Church was not advancing, it was diminishing, and it seemed rather a reality of the past and not the bringer of the future. And in that moment, we hoped that this relationship would be renewed, that it would change; that the Church would once again be a force of tomorrow and a force of today. And we knew that the relationship between the Church and the modern period was a bit in conflict, beginning with the error of the Church in the case of Galileo Galilei; we thought we could correct this wrong beginning and find the union between the Church and the best forces in the world in order to open up the future of humanity, to open true progress. So we were full of hope, of enthusiasm, and of the will to do our part for this thing.[13]

Interestingly enough, the day this speech was reported to the world, February 15, it began the 450th anniversary of Galileo's birth, followed four days later with the 540th anniversary of Copernicus' birth. February 15 was also the day the asteroid that has been heading toward Earth for some years now came to its closest approach, 17,000 miles; as well as the day that a large meteor, with the force of multiple atomic bombs, struck a Russian city; both events, perhaps, reminding us that Heaven is watching and can bring the heavens down upon us very quickly for our immorality and faithlessness.

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[13] Pope Benedict's farewell address to priests at the Vatican, as reported by *L'Osservatore Romano*, February 14, 2013, page 4, paragraph #5 in the article "Al concilio pieno di entusiasmo e speranza." The fifth paragraph in the original Italian is: "Allora, noi siamo andati al Concilio non olo con gioia, ma con entusiasmo. C'eras un'aspettativa incredibile. Speravamo che tutto si rinnovasse, che venisse veramente una nuova Pentecoste, una nuova era della Chiesa, perché la Chiesa era ancora abbastanza robusta in quel tempo, la prassi domenicale ancora buona, le vocazioni al sacerdozio e alla vita religiosa erano già un po'ridotte, ma ancora sufficienti. Tuttavia, si sentiva che la Chiesa non andava avanti, si riduceva, che sembrava piuttosto una realtà del passato e non la portatrice del futuro. E in quel momento, speravamo che questa relazione si rinnovasse, cambiasse; che la Chiesa fosse di nuovo forza del domani e forza dell'oggi. E sapevamo che la relazione tra la Chiesa e il periodo moderno, fin dall'inizio, era un po'contrastante, cominciando con l'errore della Chiesa nel caso di Galileo Galilei; si pensava di correggere questo inizio sbagliato e di trovare di nuovo l'unione tra la Chiesa e le forze migliori del mondo, per aprire il futuro dell'umanità, per aprire il vero progresso. Così, eravamo pieni di speranza, di entusiasmo, e anche di volontà di fare la nostra parte per questa cosa."

Whatever the implications of these current events, the most important thing to realize is that we now we have it from the horse's mouth, so to speak, that Vatican II was implemented for the express purpose of correcting the so-called "errors" of the traditional Church, and the first and foremost "error"—the only error that receives mention—was the Church's decision against Galileo. Since Father Joseph Ratzinger was at the Council in 1962 and personally knew many of its major participants, his inside knowledge of what we can now call the "Galileo mentality" of Vatican II, must be taken as a reliable testimony. Due to his witness, it may be safe to conclude that if the Church of 1962 had not concluded that the Church of 1616 made an "error" in the Galileo case, Vatican Council II may never have happened. In the end, either the 1616 Church was in error or the reason for initiating Vatican II was in error.

But perhaps there is a different light in which we can view the Pope's words concerning Galileo. In 1990, the then Cardinal Ratzinger said these contrasting conclusions about the Galileo affair:

> Today, things have changed. According to Bloch, the heliocentric system—just like the geocentric—is based upon presuppositions that can't be empirically demonstrated. Among these, an important role is played by the affirmation of the existence of an absolute space; that's an opinion that, in any event, has been cancelled by the Theory of Relativity. Bloch writes, in his own words: "From the moment that, with the abolition of the presupposition of an empty and immobile space, movement is no longer produced towards something, but there's only a relative movement of bodies among themselves, and therefore the measurement of that [movement] depends to a great extent on the choice of a body to serve as a point of reference, in this case is it not merely the complexity of calculations that renders the [geocentric] hypothesis impractical? Then as now, one can suppose the earth to be fixed and the sun as mobile."

We might also add this statement he made, quoting Feyerabend, in the same speech:

> At the time of Galileo the Church remained much more faithful to reason than Galileo himself. The process against Galileo was reasonable and just.[14]

Perhaps, then, we should be more open to the idea that Cardinal Ratzinger's views of cosmology, particularly the geocentric universe, changed from negative in 1962 (the opening of Vatican Council II) to more positive in 1990. If true, then it also means his 2013 recounting of the pro-Galileo mentality of 1962 is not for the purpose of necessarily siding with it, but of indicating to us that the Vatican II prelature made hasty and unwarranted presumptions about the past, many of which led to the spiritual disaster the Church experienced soon after Vatican II's doors were closed in 1965 when the numbers of churches, priests, seminarians, nuns and Catholic schools began to dwindle very rapidly and social upheaval in the Church and the world became unprecedented. We can only conclude that the very Council called in 1962 to correct the "errors" of the past was itself in error for accusing the past. Obviously, there is no way out of such a negative scenario for Vatican II's prelature, since if they reserve the right to put the Church of the past in error then there is nothing to make themselves immune from a similar or even bigger error. As the old saying goes, 'what goes around comes around,' or, better, 'what is good for the goose is also good for the gander.'

The sad fact is, the Galileo-incited "Church of the past was in error" mentality of Vatican II's prelature eventually forced them to question many other beliefs and practices of the Church's past; and this ecclesiastical introspection led them to the presumptuous conclusion that, in addition to the Galileo case, many other past decisions were "in error" as well. In fact, Vatican II's pro-Galileo mentality led to a complete revamping of how the Catholic Church understood herself and her scriptural foundation, which began in the mid-1800s right after Gregory XVI had taken Galileo's book off the Index in 1835. The new view of Church and Scripture was officially endorsed in Pius XII's 1943 encyclical *Divino Afflante Spiritu*, and ended with Vatican II's *Dei Verbum* 11 which, as the modern prelature desired to understand it, taught the unprecedented idea that Scripture is only inerrant when it speaks on things concerning salvation, not history or science. Consequently, because of the "Galileo mentality," it is safe to say that the presumed "error" of the 1616 Church caused the whole tidal wave of historical criticism of the Bible that became prevalent first in the Protestant churches and eventually seeped into the Catholic Church with great force. Along with those new "critical" interpretations of Scripture came a whole new set of mores and practices (including sex, sexual roles, marriage, reproduction, other religions, miracles, politics, *etc*.). Just about any traditional belief or practice could be brought into question based on the idea that past theologians simply misinterpreted the Bible and/or mistakenly believed the Bible had the authority to determine an issue that was outside the strict bounds of salvation. To solve this problem, it has recently been admitted by Cardinal Kasper that in various instances the wording of Vatican II's documents were made deliberately ambiguous so that both the traditional side and the modern side could formulate different interpretations.[15]

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[14] From a speech given in Parma, Italy, March 15, 1990, titled: "The Crisis of Faith in Science," partly reported in *Il Sabato*, March 31, 1990, pp. 80ff, and in the *Corriere della Sera*, March 30, 1990, and cited in *30 Days*, January 1993, p. 34, and referenced also by Atila S. Guimarães in "The Swan Song of Galileo's Myth," published by *Tradition in Action*, nd. Paul Feyerabend notes: "Cardinal Joseph Ratzinger, who holds a position similar to that once held by Bellarmine, formulated the problem in a way that would make a revision of the judgement [against Galileo] anachronistic and pointless. *Cf.* his talk in Parma of 15 March 1990….As witnesses the Cardinal quoted Ernst Bloch ('being merely a matter of convenience the scientific choice between geocentrism and heliocentrism cannot overrule the practical and religious centricity of the earth'), C. F. von Weizsäcker ('Galileo leads directly to the atom bomb') and myself (the chapter heading of the present chapter)" (*Against Method*, 3rd edition, Verso, London, New York, 1975, 1996, p. 134). Feyerabend's "chapter heading" states: "The Church at the time of Galileo not only kept closer to reason as defined then and, in part, even now; it also considered the ethical and social consequences of Galileo's views. Its indictment of Galileo was rational and only opportunism and a lack of perspective can demand a revision" (*ibid.*, p. 125).

Be that as it may, we cannot fail to realize that although the desire to correct "errors" may have been in the mind of many of the Vatican II prelature (including Father Joseph Ratzinger), quite ironically, in the end Vatican II said nothing about Galileo, even though, as we shall see later in our book, attempts were made by various liberal factions to have the Council exonerate Galileo. The closest Vatican II came to alluding to the Galileo case was the statement in *Gaudium et spes* saying that the Church should allow science free reign to do science. Yet, even this statement was innocuous, since the Church has never been against allowing science to do science. Science collects data. It has invented many sophisticated instruments to do so. It makes wonderful machines to benefit our lives. The Church accepts these inevitabilities. She has only interjected that, as was the case with Galileo, if and when science's *interpretation* of the data conflicts with the settled doctrines of Christianity, then the interpretation needs to be modified or replaced. Scientific data is plentiful and very useful. But *interpretation* of scientific data is as fraught with misunderstanding and error as the interpretation of the data in Holy Scripture. There are so many personal biases and philosophies that influence interpretation it is a wonder we ever arrive at the truth. Disagreement on the interpretation of Scripture is the very reason for the split of the eastern from the western Church in 1054 and the Protestant Reformation in 1520, among many other splits.

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[15] Cardinal Walter Kasper made the long-awaited admission in L'Osservatore Romano on April 12, 2013. Here are some choice excerpts from the article: "In many places, [the Council Fathers] had to find compromise formulas, in which, often, the positions of the majority are located immediately next to those of the minority, designed to delimit them. Thus, the conciliar texts themselves have a huge potential for conflict, open the door to a selective reception in either direction." "For most Catholics, the developments put in motion by the council are part of the church's daily life. But what they are experiencing is not the great new beginning nor the springtime of the church, which were expected at that time, but rather a church that has a wintery look, and shows clear signs of crisis." "For those who know the story of the twenty councils recognized as ecumenical, this [the state of confusion] will not be a surprise. The post-conciliar times were almost always turbulent. The [Second] Vatican, however, is a special case."

As regards to being influenced by the aura of science, Catholics are not alone. Protestants are also prone to biased influence from modern academia. Although some have forged a valiant fight against evolution by using the tenets of science itself, when issues of cosmology arise, they invariably side with Darwin's intellectual cousins, *e.g.*, the Big Bang and Einstein's Relativity. They do so for the same reason Catholics do – it is much too embarrassing in today's world to take a strict literal view of the Bible and believe the Earth was made first, is motionless, and was placed in the center of the universe. As one popular Protestant writer put it, "While geocentrists are well intended, their presence among recent creationists produces an easy object of ridicule by our critics."[16] The quest today is to appear intelligent and well-versed in modern scientific thought so that the world might not view Christians as ignoramuses or fanatics that cannot see reality.

As we have seen in volumes one and two, the embarrassment is, as the saying goes, all in their heads. The things about which they should be embarrassed, they are not; the things about which they are not embarrassed, they should be. As to the first category, they should be hiding their heads in shame for the contradictory way they view the Bible. On the one hand, conservative Protestants tout the literal interpretation of

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[16] Danny Faulkner, PhD, "Geocentrism and Creation," *Technical Journal*, August 1, 2001, at http://www.answersingenesis.org/articles/tj/v15/n2/geocentrism. See my rebuttal to Faulkner at www.galileowaswrong.com.

Genesis as a necessary foundation for dealing with Darwin's evolution, yet as the Bible's literal teaching on geocentrism is found in the same chapter, suddenly all their devotion to literalism vanishes and Scripture is demoted to symbols and metaphors. Protestant conservatives are so staunch in interpreting Genesis 1:20-31 as literally as possible (*i.e.*, the chronology of the creation of the fish, birds, animals and man) but invariably render Genesis 1:1-19 as non-chronological (*i.e.*, the creation of the Earth, firmament, plants, and celestial bodies). Whether they realize it or not, dichotomizing Genesis 1 in this way is a blatant contradiction in their hermeneutic.

On the other hand, Catholics have a long tradition of interpreting the Bible literally, even more so than Protestants. The core of Catholic theology—the sacraments—is based on the literal interpretation of such passages as Matthew 26:26 ("This is my body"), which is interpreted as referring to the literal body of Christ, whereas most Protestant denominations have a visceral aversion to such literalism and thus believe that Jesus was only speaking symbolically. Similarly, Catholics believe the words of John 3:5 ("unless a man is born of water and the Spirit") require literal water be employed as the means of receiving God's grace, such that without the proper application of water the salvation is not procured; whereas most Protestant denominations hold it is silly to interpret such passages literally, believing the water is merely a symbol for cleansing.

Conversely, when the Catholic is discussing passages in Genesis concerning cosmogony and cosmology—in which it is actually easier to believe the Earth is young and in the center of the universe than it is to believe a wafer of bread becomes the body of Christ—today he has little hesitation in figuratizing Genesis while he literalizes the Gospels. A more contradictory state of affairs is hard to imagine.

The reason for these hermeneutical contradictions is simple. Both Catholics and Protestants have been unduly influenced by men in white lab coats who write all kinds of fancy equations and provide fantastic machines that benefit mankind. Hence, the scientists have convinced the religionists that the scientists know better and that it would be foolish to argue against their theories and equations. As such, scientists are quite the formidable foe, to say the least. They are the modern version of Goliath. But as we have shown in the first two volumes, once one puts his mind and will to work, it is rather easy to blow down the house of cards that modern cosmology and cosmogony has built for itself. They themselves admit their own ignorance and weaknesses in these two areas.

Once we expose the fallacious foundations and presumptuous theories, we will have a whole new perspective from which to examine the historical issues concerning the Church's dealing with Galileo. No longer will we be forced to search, as most Galileo historians are prone to do today, for the "real" reason the Church condemned Galileo and heliocentrism. We already know the real reason, and it is simple: Galileo was wrong and the Church was right.

Once we see how the modern scientific community, stemming mainly from the theories of Albert Einstein who purposely misrepresented the scientific data in order to avoid the clear evidence that Earth was motionless in the center of the universe, we will no longer be embarrassed but will hold our heads up high, realizing that the Holy Spirit has been guiding the Church throughout the centuries with the knowledge that Earth is, indeed, in a special place. We will see that geocentrism was, and still is, the Church's official teaching on cosmology. It began with the Church Fathers and was handed down to the medievals, through the Tridentine catechism, and capped by the diligent work and permission of two popes, Paul V and Urban VIII, who dealt directly with Galileo, and many more prelates who preserved their work in later centuries.

Although many are under the assumption that the Catholic Church has officially thrown in the towel on the Galileo issue, such is hardly the case. There is a very big difference between popular viewpoints and official teaching in the Catholic Church, especially in the aftermath of Vatican Council II. The Church's last remaining official statement still upholds the condemnation of both Galileo and heliocentrism, in spite of what is often made of John Paul II's speech to the Pontifical Academy of Science in 1992, which was neither an official teaching of the Catholic Church nor did it say anything definitive to settle the issue.

We will also find in our historical study that the two instances in which the Church seemed to relax some of its earlier condemnations against heliocentrism, namely, the issuance of an imprimatur in 1820 to Canon Settele's book on heliocentrism, and the removal of Galileo's name from the *Index of Forbidden Books* in 1835 in the reign of Gregory XVI, are instances filled with ecclesiastical malfeasance, and which, in the end, do nothing to change the tradition and the decrees of 1616 and 1633 when Galileo and heliocentrism were condemned.

Suffice it to say, when a thorough investigation is brought to bear on these events, everything will begin to make sense. We will understand why our Church Fathers maintained a unanimous consensus on the topic of geocentrism against the Greek Pythagorean school that promoted heliocentrism. We will understand why the medieval theologians likewise were unswerving in their belief in geocentrism, and why the Tridentine fathers included four citations promoting geocentrism in the 1566 catechism. We will discover why Paul V and Urban VIII were so vociferous against Galileo and why they both worked diligently behind the scenes, long before his 1633 trial, to silence him and the heresy of heliocentrism, and how this was supported by many other popes, cardinals and bishops who followed them.

We will also see that, even in recent times, the Church has shown indications she is still abiding by her historical condemnations. For example, in 1833, only 180 years ago, a Catholic disclaimer was put on Newton's *Principia* stating that the "Supreme Pontiffs have decreed against Newton that the Earth does not move." In 1850, only 163 years ago, the Church commissioned Mario Marini to write a book defending the Church's stand against heliocentrism. In 1942, only 71 years ago, the president of the Pontifical Academy of Science, Agostino Gemelli, said "…although Galileo did not provide a decisive demonstration of Copernicanism, neither did Newton, Bradley, or Foucault." In 1965, only 48 years ago, Vatican II refrained from condoning heliocentrism or saying that the Church made a mistake in teaching geocentrism, even though many clerics were clamoring for it. So, within the last century or two, we have the Church still making comments supporting the prior tradition on geocentrism, and issuing no official statement rejecting what the Church previously decreed against heliocentrism. One just has to dig a little to find it, which is what this volume you are holding has done for you.

At the same time, however, we must admit that although the Catholic Church made no official statement rejecting geocentrism and endorsing heliocentrism, it was, and is, the common belief in the hierarchy and the Catholic populace today that the Church of 1616 and 1633 erred in its condemnation of heliocentrism. The belief that the medieval Church had erred is so prevalent it can be safely said, as even Pope Benedict XVI finally admitted, that one of the main reasons Vatican Council II sought to reword certain Catholic positions is because many prelates believed that if the Church had erred in the past with Galileo (whether that error was in condemning heliocentrism or even believing that the Church had the right to make decisions on a scientific issue), then the Church might have erred, or possibly have been shortsighted, in other areas, and thus she needed to have her doctrines "readjusted," as it were, to conform to current times. We might say that there was somewhat of a "Copernican revolution" at Vatican Council II. In fact, one of the more controversial documents of Vatican II is titled *Nostra Aetate*, literally meaning, "In Our Times," which concerns the Church's relationship with the religions of the world. It is safe to say that the Church, through *Nostra Aetate*, has either "adjusted" the traditional view or sought for a different emphasis on Church teaching that was previously only a cursory opinion or *obiter dicta*. Other such controversial documents of this nature in Vatican II are *Dignitatis humanae*, *Dei verbum*, *Lumen gentium*, *Gaudium et spes*, and *Unitatis* *redintegratio*. Essentially each of these documents brings the Church closer to the world's views on religion, science, history, and politics. The melding was made more prominent and pervasive when the documents were interpreted by the more liberalized factions in the Catholic Church of the latter twentieth century (as contrasted with pre-twentieth century conservative Catholicism). Not surprising is the fact that all of them have one thing in common – they all believe the Church erred concerning Galileo and thus could have erred in other issues as well.

Be that as it may, we receive the impetus for our study from the words of John Paul II to the Pontifical Academy of Science in November 1992:

> "*It is a duty for theologians to keep themselves regularly informed of scientific advances in order to examine…whether or not there are reasons for taking them into account in their reflection or for introducing changes in their teaching*."

Keeping "regularly informed of scientific advances" so that theologians can "introduce changes in their teaching" is precisely what this series of books encourages modern "theologians" to do. When they realize there is no scientific proof for heliocentrism, and that geocentrism has much more scientific credibility than previously reported, they should, as John Paul II admonished them, have enough information to "introduce changes in their teaching" as they consider the facts of science in a whole new way, leading, hopefully, to a moratorium on apologizing for the popes and cardinals of the seventeenth century and, in turn, giving them the respect they are due as stewards of the Gospel. Once an honest, studious and open-minded analysis is made of the scientific and historical evidence, one will be able to see that the Holy Spirit was, indeed, guiding the Church of yesteryear to censor Copernicanism and, in turn, insist that we take Scripture's propositions at face value. Without scientific proof for heliocentrism, today's Church is under no obligation to entertain Copernicanism as more than a curious hypothesis, and, consequently, she is neither under divine compulsion nor can claim any reason to abandon the literal interpretation of Scripture.

Most of all, you will see that the Holy Spirit's promise to lead the Church into all truth until the end of time (John 14:16) has been fulfilled, since, by the discoveries from modern science, geocentrism has been shown to be scientifically accurate and the Church has never changed her official teaching on that truth. You will see that what is happening today to promote the contrary is a plot by the principalities and powers to dethrone the Church and make atheistic science the god of this world. But it will no longer stand. The god of this world will be defeated, just as David killed Goliath. This series of books is designed to do that very thing. It is time for a spiritual revolution and, to borrow the words of historian Thomas Kuhn, to produce a scientific "paradigm shift." You will help make it part of history.

Robert Sungenis
February 14, 2013

"The main source of the present-day conflicts between the spheres of religion and of science lies in this concept of a personal God."

Albert Einstein[17]

"The Lord God is subtle, but malicious he is not."

Albert Einstein[18]

"I have second thoughts. Maybe God is malicious."

Albert Einstein[19]

"A conflict arises when a religious community insists on the absolute truthfulness of all statements recorded in the Bible."

Albert Einstein[20]

"We, however, who extend the accuracy of the Spirit to the merest jot and tittle, will never admit the impious assertion that even the smallest matters were dealt with haphazardly by those who have recorded them."

Gregory of Nazianzus[21]

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[17] Albert Einstein, *Ideas and Opinions*, 1954, 1984, p. 47.

[18] Originally said to Princeton University mathematics professor Oscar Veblen, May 1921, upon hearing that an experimental result by Dayton C. Miller would contradict his theory of gravitation. *The Expanded Quotable Einstein*, p. 241.

[19] To Valentine Bargmann. Quoted in Sayen's *Einstein in America*, p. 51, cited in *The Expanded Quotable Einstein*, p. 241.

[20] Albert Einstein, *Ideas and Opinions*, p. 45.

[21] *Orations*, II.

Chapter 14

Scripture's Teaching on Geocentrism

How Much Authority Does Scripture Possess Regarding Science?

Harvard historian I. Bernard Cohen gives us the secular world's view of the inevitable clash that would occur between Copernicanism and Scripture:

> One necessary consequence of his system was the position that the literal interpretation of Scripture cannot be the ultimate test for scientific explanation of the observed phenomenon of the world of nature around us. Like it or not, *De Revolutionibus* could not avoid constituting a challenge to authority. A significant feature of the Scientific Revolution was to base knowledge on experiment and observation and to disdain any authorities other than nature herself. The motto of the Royal Society, founded a little over a century after the publication of *De Revolutionibus*, was "Nullius in verba" (On the word of no man). Whether or not Copernicus was actually a major figure in this revolutionary tilt of knowledge away from authority, he has come to symbolize the first mover in this direction of science and it is an honorable role….In arguing for the 'reality' of his own system, and in not going along with those for whom 'reality' was not a central question, Copernicus was certainly a rebel. It is even reasonable to call him a revolutionary.[22]

Someone once said, "Scripture is not a science book." Although there is a certain degree of truth in that statement, unfortunately it has been badly misrepresented in arguments dealing with the Galileo affair. It has been used to politely take Scripture out of the jury room on whether Galileo's hypothesis was correct. Advocates of the heliocentric theory often make a glib reference to a certain Cardinal Baronius who in 1598 is said to have made the following summation of the supposed dichotomy between science and Scripture: "The Holy Spirit tells us how to get to heaven, not how the heavens go."[23] Various strains of this sentiment have been used throughout the last few centuries to silence theologians who seek to extract various truths from Scripture with which to build an understanding of the universe. For example, Catholic author George Sim Johnston writes:

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[22] I. Bernard Cohen, *Revolution in Science*, p. 492.

> Galileo accepted the inerrancy of Scripture; but he was also mindful of Cardinal Baronius's quip that the bible "is intended to teach us how to go to heaven, not how the heavens go." And he pointed out correctly that both St. Augustine and St. Thomas Aquinas taught that the sacred writers in no way meant to teach a system of astronomy. St. Augustine wrote that:
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> > One does not read in the Gospel that the Lord said: I will send you the Paraclete who will teach you about the course of the sun and moon. For He willed to make them Christians, not mathematicians.
>
> Unfortunately, there are still today biblical fundamentalists, both Protestant and Catholic, who do not understand this simple point: the bible is not a scientific treatise. When Christ said that the mustard seed was the smallest of seeds (and it is about the size of a speck of dust), he was not laying down a principle of botany. In fact, botanists tell us that there are smaller seeds. He was simply talking to the men of his time in their own language, and with reference to their own experience.[24]

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[23] Galileo wrote it quite poetically in his native Italian to Madama Cristina di Lorena: "…ciò è l'intenzione dello Spirito Santo essere d'insegnarci come si vadia al cielo, e non come vadia il cielo" ("that is the intention of the Holy Spirit which is to teach us how to go to heaven, and not how the heavens go") and attributes it as coming from "Io qui direi quello che intesi da persona ecclesiastic constituita in eminentissimo grado" ("Here I refer to the understandings of an ecclesiastical person in a very eminent position"), who most suppose is Cardinal Cesare Baronio (*Le Opere di Galileo Galilei*, 1968, vol. 5, p. 319, lines 25-28).

[24] George Sim Johnston, "The Galileo Affair," *Lay Witness,* Vol. 14, No. 7, April 1993, p. 5. Johnston's claim that the mustard seed upsets the inerrancy of Scripture is shortsighted and fails to contextualize. Jesus was referring to the

It frequently occurs that in arguments defending Galileo various quotes are extracted from famous prelates and saints but often without thinking them through. Such is the case here. Although Scripture certainly does not reach the level of a science book, that does not mean it cannot, or does not, address scientific issues on various occasions. The difference is subtle, but it is very important. For example, we can all agree that the *Declaration of Independence* and the *United States Constitution* are not religious documents. Most categorize them as political documents. But every American will agree that when either of the two documents address a matter of religion, such as when the *Declaration of Independence* says: "We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness," all ears stop to listen, since everyone acknowledges that the *Declaration* is giving factual and authoritative statements about religion that form the basis of the country's foundation of government. The *Declaration* is certainly not a religious treatise, but it is, nevertheless, addressing an important area of religion in this particular instance, and it holds the same authority in that instance as it does when it speaks about political and governmental issues.

In the same way, although Scripture is not a science book and thus does not employ formulas such as $E = mc^2$ or $F = ma$, nevertheless, when it touches upon an area of science, men need to listen, for it is giving factual and authoritative statements that form the basis of our cosmogony and cosmology. Discovering the scientific formulas that coincide with those foundational truths has been assigned to man's labor under the six days God has given him to work by the sweat of his brow, and as such, man's science can safely complement divine revelation. Revelation does not seek to impinge upon man's freedoms and intellectual pursuits, but only to save him from the heartache and frustration of proceeding down the wrong scientific path, especially in areas regarding the creation of the world that no human being was present to witness, or with the structure of the cosmos from which no man has a high enough platform to determine which bodies are moving and which are not. As Pope St. Pius X once wrote:

> Human science gains greatly from revelation, for the latter opens out new horizons and makes known sooner other truths of the natural order, and because it opens the true road to investigation and keeps it safe from errors of application and of method. Thus does the lighthouse show many things they otherwise would not

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known seeds of the land of Palestine, for in that region the mustard seed was, indeed, the smallest seed.

> see, while it points out the rocks on which the vessel would suffer shipwreck.[25]

Or as Gregory of Nazianzus once put it:

> We, however, who extend the accuracy of the Spirit to the merest jot and tittle, will never admit the impious assertion that even the smallest matters were dealt with haphazardly by those who have recorded them.[26]

Accordingly, God drops small and precious rose petals of knowledge down from heaven to guide man in the paths of truth about the cosmos. It is only when we ignore this sweet-smelling flora that we soon go off into the myriad of conflicting theories man has concocted since the time of Copernicus, and which, as we have shown in the first volume, are unfortunately being added to the unhealthy diet of modern science on a daily basis.

In light of these principles, Johnston's appeal to St. Augustine's statement: "I will send you the Paraclete who will teach you about the course of the sun and moon. For He willed to make them Christians, not mathematicians,"[27] actually speaks more against Johnston's case than for it. Notice first that Augustine reaffirms that the sun and the moon move, not the Earth. Obviously, Augustine does not intend to go against all the statements he made in his other works affirming the Earth's motionlessness and the sun's movement. Second, Augustine's concern regards only that the Lord did not intend to teach how the sun and moon move in their courses, not that the Lord did not intend to teach that the sun and moon move. That is, the Lord did not desire to give us detailed information as to what pushes or pulls the sun and moon around the Earth, or how it is that they keep such precise time year after year. But we can certainly conclude from the Lord's teaching that the sun and moon move. Christians don't have to become "mathematicians" in order to know the simple fact that the celestial bodies revolve around the Earth. A child could understand it. Mathematics is necessary only when one wants to calculate such things as how fast the sun and moon accomplish their appointed tasks or how far away they are from Earth. Hence, because the Lord taught them in Scripture that the sun and moon move around the Earth, it was for that very reason that St. Augustine and St. Thomas were both geocentrists, in opposition to the Greeks and Indians who were promoting heliocentrism.

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[25] Pope Pius X, encyclical of March 12, 1904, *Iucunda Sane*, 35.

[26] *Orations*, II.

[27] Another version is: "we do not read in the Gospel that the Lord said: I will send you the Paraclete to teach you how the sun and moon move. Because he wished to make them Christians, not mathematicians" (Paul Newall, "The Galileo Affair," The Galilian Manuscripts Library, wwwgalilean-library.org, p. 8, citing *De Actis cum Felice Manichaeio*, I, 2).

Johnston's attempt to commandeer Augustine to support heliocentrism is common among Catholic authors who are seeking some way to counter the magisterium's condemnation of Copernican cosmology and Galileo's support of it in the 1600s. All these attempts, of course, are done in the face of the fact that Augustine, as we will see later, believed firmly in geocentrism and defended it vigorously. Ignoring these facts, heliocentric advocates will often appeal to Augustine's general hermeneutical principles concerning the need to be cautions when science and Scripture seem to clash, or they will take Augustine's comments out of context and make it appear as if he is saying one thing when, in fact, he is saying quite another. For example, Galileo historian, Annibale Fantoli, in his 1997 book *Galileo: For Copernicanism and for the Church*, introduces an argument from Galileo that makes it appear as if Augustine had no commitment or interest in geocentrism and would much prefer dealing with matters of salvation. Fantoli writes:

> But, comments Galileo, the mobility or stability of the Earth or of the Sun are not questions of faith or morals, and as to those who uphold the mobility of the Earth none of them has ever wished to abuse the sacred texts by making use of them to bolster his own opinion. And the opinion of the Council, Galileo adds, is in agreement with the attitude of the Fathers who considered it useless to try to solve the problems of nature, as seems to in the case of St. Augustine who, when confronted with the question as to whether the heavens are fixed or move, answered (*De Genesi ad Litteram*, L.2, c.10):
>
> > To them I answer that these things should be examined with very subtle and demanding arguments to determine truly whether or not it is so; but I do not have the time to undertake and pursue these investigations, nor should such time be available to those whom we desire to instruct for their salvation and for the needs and benefit of the Holy Church (V, 337; trans. By Finocchiaro 1989, 109).[28]

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[28] Annible Fantoli, Galileo: *For Copernicanism and the Church*, translation by George V. Coyne, S. J., second edition, 1996, p. 203. In The Case of Galileo, 2012, Fantoli says: "And he [Augustine] adds that the sacred writers had no intention to teach anything about the form and figure of the heavens nor about any

The problem is that, in context, Augustine is not talking about whether the sun revolves around the Earth, or the Earth revolves around the sun. Augustine is concerned only with the question of whether the firmament itself revolves around the Earth or if the stars revolve around the Earth while the firmament remains fixed. Chrysostom posed this very question. He posited that the heavens are immobile, but the sun and stars revolve around a fixed Earth:

> The heaven, for instance, hath remained immoveable, according as the prophet says, 'He placed the heaven as a vault, and stretched it out as a tent over the earth.' But, on the other hand, the sun with the rest of the stars, runs on his course through every day. And again, the earth is fixed, but the waters are continually in motion; and not the waters only, but the clouds, and the frequent and successive showers, which return at their proper season.[29]

Rest assured, Augustine has no doubts that either the firmament or the stars and sun are revolving around a stationary Earth. As such, we can then understand the context of *De Genesis ad Litteram* L.2, c. 10 more clearly. Augustine writes:

> With regard to the motion of heaven, certain Christian writers have enquired whether it is in reality stationary or moving [*e.g.*, Chrysostom]. If it is moving, they say, in what sense is it a firmament? But if it is stationary, how do the heavenly bodies that are thought to be fixed in it travel from east to west and the stars of the Wain complete their smaller orbits near the north pole? They present the picture of heaven turning either like a sphere, if we suppose another axis not visible to us extending from another pivotal point, or like a disk, if there is no other axis.

Augustine then states what Galileo quoted above, (although the translation is slightly different in this version):

> My reply is that there is a great deal of subtle and learned enquiry into these questions for the purpose of arriving at a true view of the matter; but I have no further time to go into these questions and discuss them, nor should they have time whom I

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questions about nature 'since such knowledge was of no use to salvation'" (*The Case of Galileo*, p. 40).

[29] *Homilies to Antioch*, Homily XII, PG 49, 128.

> wish to see instructed for their own salvation and for what is necessary and useful in the Church.

The remaining part of Augustine's paragraph (that neither Galileo nor Fantoli quote from the passage) confirms that Augustine's concern is whether the firmament revolves around a stationary Earth, or the stars revolve around a stationary Earth:

> They must certainly bear in mind that the term "firmament" does not compel us to imagine a stationary heaven: we may understand this name as given to indicate not that it is motionless but that it is solid and that it constitutes an impassable boundary between the waters above and the waters below. Furthermore, if the evidence shows that the heavens actually are immovable, the motion of the stars will not be a hindrance to our acceptance of this fact. The very scholars who have devoted the most exhaustive study to this subject have concluded that if the stars alone were moved while the heavens were motionless, all the known phenomena observed in the motions of the stars might have taken place.[30]

Suffice it to say, the above attempt by Galileo and his modern supporters to commandeer Augustine to their cause is a typical example of how the great saint's words are often twisted to teach Copernicanism when, in fact, Augustine is teaching the exact opposite. Unfortunately, Augustine's respect of science is often an easy target for abuse by those seeking to boost the ideas of modern science (*e.g.*, evolution and heliocentrism). In the process, little attention is paid to Augustine's devotion to Scripture as the final authority on such matters and neither are his warnings heeded against the false claims of science. He writes:

> But since the words of Scripture that I have treated are explained in so many senses, critics full of worldly learning should restrain themselves from attacking as ignorant and uncultured these utterances that have been made to nourish all devout souls….But more dangerous is the error of certain weak brethren who faint away when they hear these irreligious critics learnedly and eloquently discoursing on the theories of astronomy or on any of

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[30] *The Literal Meaning of Genesis* in *Ancient Christian Writers*, editor: Johannes Quasten, translated by John Hammond Taylor, S. J., Vol. 1, NY, Newman Press, 1982, pp. 60-61, from Book 2, Chapter 10, Para. 23: "The motion of heaven and the meaning of the firmament."

> the questions relating to the elements of this universe. With a sigh, they esteem these teachers as superior to themselves, looking upon them as great men; and they return with disdain to the books which were written for the good of their souls; and, although they ought to drink from these books with relish, they can scarcely bear to take them up.[31]

Language of Fact versus Language of Appearance

Before we address the particular Scriptures that are associated with geocentrism, we will tackle a common objection that is levied against using Scripture to teach geocentrism. Both scientists and modern biblical exegetes claim that when Scripture employs language such as "the sun rises" or "the sun sets," it is merely attempting to express the motions of the heavenly bodies in figurative or phenomenal language since a rising or setting of the sun is the view that a person standing on Earth would observe, but it is not the true reality. The astronomer will argue that even though he sees the sun rise over the horizon, he, being a knowledgeable scientist, knows that in reality it is the Earth rotating on its axis that makes it appear as if the sun is rising. Likewise, the biblical exegete will often point to figurative language employed hundreds of times in Scripture (*e.g.*, Psalm 98:8: "Let the floods clap their hands: let the hills be joyful together") and insist that the sun's "rising" is of the same linguistic genre and thus it need not be interpreted literally. The Catholic may even refer to the words of Pope Leo XIII in his teaching about the interpretation of Scripture:

> The unshrinking defense of the Holy Scripture, however, does not require that we should equally uphold all the opinions which each of the Fathers or the more recent interpreters have put forth in explaining it; for it may be that, in commenting on passages where physical matters occur, they have sometimes expressed the ideas of their own times, and thus made statements which in these days have been abandoned as incorrect.[32]

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[31] *The Literal Meaning of Genesis*, Book 1, Chapter 20, Para. 41, Ancient Christian Writers, *ibid*., p. 44.

[32] The 1893 encyclical: *Providentissimus Deus: On the Study of Holy Scripture*, "Natural Sciences," Boston, Pauline Books and Media, p. 24. All in all, Leo XIII reinforced the traditional "literal" approach to Scripture interpretation, as noted in the following statement of the same encyclical: "For Sacred Scripture is not like other books. Dictated by the Holy Spirit, it contains things of the deepest importance, which, in many instances, are most difficult and obscure" (p. 8);

He may also quote Pope Pius XII for the same purpose:

> For of the modes of expression which, among ancient peoples, and especially those of the East, human language used to express its thought, none is excluded from the Sacred Books [The Bible], provided the way of speaking adopted in no wise contradicts the holiness and truth of God, as, with his customary wisdom, the Angelic Doctor already observed in these words: 'In Scripture divine things are presented to us in the manner which is in common use amongst men.' For as the substantial Word of God became like to men in all things, 'except sin,' so the words of God, expressed in human language, are made like to human speech in every respect, except error.[33]

"Now we have to meet the Rationalists…who…set down the Scripture narratives as stupid fables and lying stories" (p. 12); "The Church…renewing the decree of Trent declares…the true sense of Holy Scripture…whose place it is to judge of the true sense and interpretation of the Scriptures; and, therefore, that it is permitted to no one to interpret Holy Scripture against such sense or also against the unanimous agreement of the Fathers" (pp. 16-17); "But he must not on that account consider it is forbidden, when just cause exists, to push inquiry and exposition beyond what the Fathers have done; provided he carefully observes the rule so wisely laid down by St. Augustine – not to depart from the literal and obvious sense, except only where reason makes it untenable or necessity requires; a rule to which it is the more necessary to adhere strictly in these times, when the thirst for novelty and unrestrained freedom of thought make the danger of error most real and proximate." (pp. 18-19); "But it is absolutely wrong and forbidden to narrow inspiration to certain parts only of Holy Scripture or to admit that the sacred writer has erred…because (as they wrongly think) in a question of the truth or falsehood of a passage we should consider not so much what God has said as the reason and purpose which He had in mind in saying it – this system cannot be tolerated" (pp. 25-26); "Let them loyally hold that God, the Creator and Ruler of all things, is also the Author of the Scriptures – and that, therefore, nothing can be proved either by physical science or archaeology which can really contradict the Scriptures" (pp. 28-29).

[33] The 1943 encyclical: *Divino Afflante Spiritu: The Promotion of Biblical Studies*, "The Importance of mode of writing," Boston, Pauline Books and Media, p. 21. Pope Pius XII also added this important warning: "Hence the Catholic commentator, in order to comply with the present needs of biblical studies, in explaining the Sacred Scripture and in demonstrating and proving its immunity from all error, should…determine…to what extent the manner of expression or the literary mode adopted by the sacred writer may lead to a correct and genuine interpretation; and let him be convinced that this part of his office cannot be neglected without serious detriment to Catholic exegesis. Not infrequently – to mention only one instance – when some persons reproachfully charge the Sacred Writers with some historical error or inaccuracy in the recording of facts, on

Although we will address this topic in greater depth in Chapter 17, for now we point out that Catholic biblical exegetes who seek to counter the geocentric declarations of past popes and cardinals frequently appeal to the above papal statements for support of their position. They will conclude that both Leo XIII and Pius XII were teaching us that we are to interpret Scripture's references to the movement between the Earth and sun by the model of heliocentrism advocated by modern science. As far as these exegetes are concerned, the case is closed, since the popes did not require us to interpret descriptive phrases such as "the sun rises" in a literal fashion, but wanted us to see them as either ancient expressions of uneducated peoples or phenomenal language from the point of view of an observer on the surface of the Earth. In either case, it is assumed that the popes were accepting heliocentrism and denying geocentrism.

Upon closer examination, however, this conclusion is more an eisegesis of what Leo and Pius actually said than a fair and accurate understanding of their words. First, in each of the above papal citations, neither pontiff makes a specific reference to Scripture's cosmological passages, thus no explicit claims can be made that the popes were referring to the movements of either the sun or the Earth. The popes could have been referring to any number of instances in which Scripture speaks in phenomenal language.[34]

Second, Scripture's phenomenal language (*e.g.*, the "sun rises" or the "sun sets") also applies to the geocentric system. In the geocentric system the sun does not actually "rise" or "set"; rather, it revolves around the Earth. When the geocentrist sees a sunset he does not say: "Oh, what a beautiful revolution of the sun," just as a heliocentrist does not say: "Oh, what a beautiful rotation of the Earth." The geocentrist and the heliocentrist know that the sun "rises" or "sets" only with respect to the Earth's horizon, and therefore, reference to a "rising sun" in Scripture is just as phenomenal in the geocentric system as it is in the heliocentric. On that basis alone neither Leo XIII's nor Pius XII's above directives can be commandeered to support heliocentrism, especially in light of the fact that three previous pontiffs, based on stricter criteria, denied heliocentrism and endorsed geocentrism, as the historical records show quite clearly.[35]

Third, Pius XII's above quotation from the words of the "Angelic Doctor," Thomas Aquinas, namely, "In Scripture divine things are

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closer examination it turns out to be nothing else than those customary modes of expression and narration peculiar to the ancients…" (pp. 21-21).

[34] *E.g.*, Nm 11:7; 1Sm 28:14; Ez 1:5; 8:2; Dn 8:15; 10:6; Jl 2:4; Am 5:8; Mt 16:3; 28:3; Mk 8:24; Lk 12:56; Ap 4:1; 15:2.

[35] Pope Paul V in 1616; Pope Urban VIII in 1633; and Pope Alexander VII in 1664.

presented to us in the manner which is in common use amongst men," cannot be interpreted as Pius' attempt to promote heliocentrism since it is a fact of history that Aquinas was an avowed geocentrist who never entertained the possibility of heliocentrism.[36] Obviously, then, Thomas could not have intended his insights on biblical interpretation to be used either to deny geocentrism or promote heliocentrism. These insights were merely his general teaching on the various modes of speech employed by the authors of Scripture, which can be applied to many and varied phenomena in nature and everyday life, but certainly not celestial orbits.

Lastly, although it is safe to say that phrases such as "the sun rises" or "the sun sets" are to be considered phenomenal from both the heliocentric and geocentric perspectives, this does not mean that Scripture *always* limits itself to phenomenal language when it addresses the movement of the heavenly bodies. The language of appearance only applies to expressions when appearance is the intended feature. One can easily surmise from language such as "the sun rises" or "the sun sets" that although Scripture may express the appearance of the movement from the perspective of the observer on Earth, nevertheless, Scripture confidently affirms the scientific fact that, of the two bodies, one of them moves and the other does not. In that particular scientific category, Scripture is adamant that it is the sun that moves, not the Earth. Hence, it is the sun that is the circling body that causes the *appearance* of the sun rising or setting over the horizon, not the Earth rotating. As we will see, there are many other passages of Scripture that are much more specific concerning the movement of the sun and the immobility of the Earth.

Official Statements from the Catholic Magisterium on the Inspiration and Inerrancy of Sacred Scripture

The Catholic Church, throughout her two-thousand year history, has been very clear and adamant in her teaching that Scripture contains no error when it speaks on theology, history, science, mathematics or any other discipline or factual proposition. Scripture cannot err because God is its main author:

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[36] Thomas Aquinas wrote: "The Earth stands in relation to the heaven as the center of a circle to its circumference. But as one center may have many circumferences, so, though there is but one Earth, there may be many heavens" (*Summa Theologica*, "Treatise on the Work of the Six Days," Question 68, Article 4). By "many heavens" Thomas is referring to the three ways in which Scripture uses the word "heaven," *e.g.*, the Earth's atmosphere; the starry cosmos; and the third heaven as God's domain above the firmament.

- **Pius IX**, condemned the following notion: "The prophecies and miracles set forth and recorded in the Sacred Scriptures are the fiction of poets, and the mysteries of the Christian faith the result of philosophical investigations. In the books of the Old and the New Testament there are contained mythical inventions..."[37]

- **Pope Leo XIII:** "It is absolutely wrong and forbidden either to narrow inspiration to certain parts only of Sacred Scripture or to admit that the sacred writer has erred."[38]

- **Pope Pius X**, condemned the notion: "Divine inspiration does not extend to all of Sacred Scriptures so that it renders its parts, each and every one, free from every error."[39]
- **Pope Benedict XV**: "...the divine inspiration extends to all parts of Scripture without distinction, and that no error could occur in the inspired text."[40]

- **Pope Pius XII**, repeats Leo XIII decree: "It is absolutely wrong and forbidden either to narrow inspiration to certain parts only of Sacred Scripture or to admit that the sacred writer has erred."[41]

- **Pope Pius XII**, condemns the notion: "...immunity from error extends only to those parts of the Bible that treat of God or of moral and religious matters."[42]

- **1964 Pontifical Biblical Commission**: "...that the Gospels were written under the inspiration of the Holy Spirit, who preserved their authors from every error."

- **1998 Congregation for the Doctrine of the Faith:** "...the absence of error in the inspired sacred texts..."[43]

- **Pope Leo XIII**: "For the sacred Scripture is not like other books. Dictated by the Holy Spirit, it contains things of the deepest importance, which, in many instances, are most difficult and obscure….For all the books in their entirety...with all their parts, have been written under the dictation of the Holy Spirit."[44]

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[37] *Syllabus of Errors*

[38] *Providentissimus Deus*

[39] *Lamentabili Sani*

[40] *Spiritus Paraclitus*

[41] *Divino Afflante Spiritu*

[42] *Humani Generis*

[43] *Professio Fidei*

- **Council of Trent:** "…the purity itself of the Gospel is preserved in the Church, which promised before through the Prophets in the Holy Scriptures…and [the Synod] clearly perceiving that this truth and instruction are contained in the written books and in the unwritten traditions, which have been received by the apostles from the mouth of Christ Himself, or from the apostles themselves, at the dictation of the Holy Spirit, have come down even to us, transmitted as it were from hand to hand, [the Synod] following the examples of the orthodox Fathers, receives and holds in veneration with an equal affection of piety and reverence all the books both of the Old and of the New Testament, since one God is the author or both, and also the traditions themselves, those that appertain both to faith and to morals, as having been dictated either by Christ's own word of mouth, or by the Holy Spirit, and preserved in the Catholic Church by a continuous succession"."[45]

- **Vatican Council 1**: "If anyone shall not accept the entire books of Sacred Scripture with all their divisions, just as the sacred Synod of Trent has enumerated them, as canonical and sacred, or denies that they have been inspired by God: let him be anathema."

- **1994 Catechism of the Catholic Church**: "Sacred Scripture is the speech of God as it is put down in writing under the breath of the Holy Spirit." …. "God inspired the human authors of the sacred books...it was as true authors that they consigned to writing whatever he wanted written, and no more."[46]

- **Pope Leo XIII**: "It is futile to argue that the Holy Spirit took human beings as his instruments in writing, implying that some error could slip in...For by his supernatural power he so stimulated and moved them to write, and so assisted them while they were writing, that they properly conceived in their mind, wished to write down faithfully, and expressed aptly with infallible truth all those things, and only those things, which He himself ordered;

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[44] *Providentissimus Deus*

[45] *Denz., 783*

[46] ¶¶ 81, 106.

otherwise He could not Himself be the author of the whole of Sacred Scripture."[47]

- **Code of Canon Law** (1983): "Even after ordination to the priesthood, clerics are to pursue sacred studies and are to strive after that solid doctrine founded in sacred scripture, handed on by their predecessors, and commonly accepted by the Church, as set out especially in the documents of councils and of the Roman Pontiffs. They are to avoid profane novelties and pseudo-science.[48]

Scriptural Passages Teaching Geocentrism

Joshua 10:10-14

[10]And the Lord threw them into a panic before Israel, who slew them with a great slaughter at Gibeon, and chased them by the way of the ascent of Bethhoron, and smote them as far as Azekah and Makkedah.
[11]And as they fled before Israel, while they were going down the ascent of Bethhoron, the Lord threw down great stones from heaven upon them as far as Azekah, and they died; there were more who died because of the hailstones than the men of Israel killed with the sword.
[12]Then spoke Joshua to the Lord in the day when the Lord gave the Amorites over to the men of Israel; and he said in the sight of Israel, "Sun, stand thou still at Gibeon, and thou Moon in the valley of Aijalon."
[13]And the sun stood still, and the moon stayed, until the nation took vengeance on their enemies. Is this not written in the Book of Jashar? The sun stayed in the midst of heaven, and did not hasten to go down for about a whole day.
[14]There has been no day like it before or since, when the Lord hearkened to the voice of a man; for the Lord fought for Israel.

One of the more important features of this passage is the involvement of the Lord in both being the cause of the celestial and atmospheric events, as well as the disposition and eventual slaughter of Israel's enemies, in this case, the Amorites. The Lord does three things: (a) he puts the enemies into a panic (vr. 10); (b) he throws down great hailstones (vr. 11); (c) he causes the sun and moon to stand still (vrs. 12-14). As such, divine intervention predominates the passage and thus we must begin the analysis from the fact that we are in the realm of miraculous events far removed from natural occurrences. Once divine intervention is accepted as an integral part of the passage, subsequently it is only a matter of deciding how God accomplished the three miracles.

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[47] *Providentissimus Deus*
[48] Canon 279.1

"Panic" and "hailstones" are not unusual occurrences in themselves, nevertheless, if the Lord is the cause we would expect them to be of severe and enduring effect so as to accomplish the purpose at hand, that is, killing the enemies of Israel. For hailstones to form instantaneously and be large enough to kill, a deliberately calculated divine intrusion had to be accomplished. In Scripture, hail appears to be a common device for divine judgment.[49] Putting opposing armies into a "panic" also seems to be a favorite divine assault.[50]

Apart from the divine intrusion described in the passage, the only other significant feature is that the sun and moon are stopped in their movements through the sky. Since by the passage's own admission there has been no other time in history where such an event has occurred (vr. 14), it makes the event highly unusual even in the realm of miraculous events.

Another distinguishing feature is the detail that is provided regarding the locations of the events. Such detail lends credibility not only to the story itself but also to its accuracy. Five distinct places are mentioned (Aijalon, Azekah, Bethhoron, Gibeon, Makkedah). Historically, Bethhoron was 5 miles WNW of Gibeon, and Azekah was 15 miles SW of Bethhoron. The Aijalon Valley, over which the moon ceased its motion, was between Aijalon and Gezer, the two cities being about 7-8 miles apart. Gibeon was about 11 miles east of Aijalon, and about 15 miles due east from the center of the Aijalon Valley. Gilgal, from which Joshua traveled all night to come to Gibeon, is about 17 miles east of Gibeon. Beyond Gezer directly west about 15 miles is the Mediterranean Sea.

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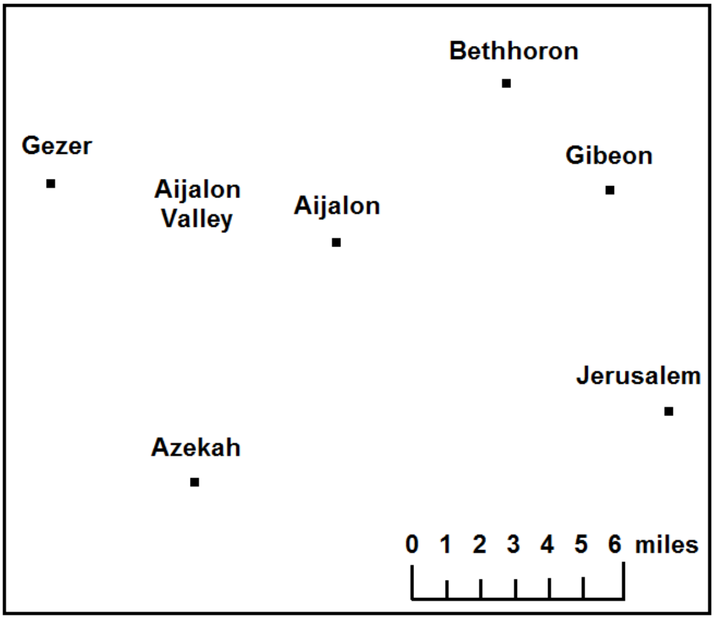
[49] Ex 9-10; Ps 18:12; 78:47-48; 105:32; Is 28:2, 17; 30:30; Ez 13:11-13; Ws 5:22; Es 46:6. In the Qumran text 4Qjosa the reading is "stones," whereas the Masoretic text reads "great stones" [אבנים גדלות] and the LXX has "stones of hail" [λίθους τῆς χαλάζης].

[50] Ex 14:24; 23:27; Jg 4:15; 8:12; 1Sm 5:9-11; 7:10; Ps 48:5; Is 31:9; Jr 51:32; Zc 12:4, 13. See also Jb 38:22-23.



According to the account in Js 10:6-12, it was at Gibeon that Joshua was standing when he made his request to God to stop the sun. The sun was most likely directly overhead, probably near noontime position. This fits the description in Js 10:13 that "the sun stayed in the *midst* of heaven."[51] Joshua also sees the moon, but it is to the west of the sun. Perhaps Joshua made the request to God at midday because after fighting the Amorites from the early morning, he could see by the early afternoon he was not going to have enough time to finish the battle by sundown, especially since he was fighting five different armies. Joshua 10:5 states:

> Then the five kings of the Amorites, the king of Jerusalem, the king of Hebron, the king of Jarmuth, the king of Lachish, and the king of Eglon, gathered their forces, and went up with all their armies and encamped against Gibeon, and made war against it.

Another possibility is that since Gibeon is situated at an elevation of between 2400 and 3000 feet above sea level, the sun, which had been rising from the east, is now positioned directly over the heads of Joshua and his army who are looking downward, WSW, upon the enemy armies. This provides Joshua with a very formidable weapon that is still used often in warfare – the glare of the sun. With the sun directly in their eyes as they look upward ENE toward Joshua's armies, the enemy armies would be severally disadvantaged as they had to deal with partial blindness. Having the sun remain in this position for several hours would be to Joshua's distinct advantage, and thus he calls to God.

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[51] "midst" is from the Hebrew חצי (chatsy), meaning "middle" or "half" (Ex 24:6; Js 1:12; 8:33; 12:2).

As he makes the request for the sun to stand still and sees it answered, Joshua determines that the moon has stopped over the Aijalon Valley. This valley begins about 15 miles due west of Gibeon and extends westward another 15 miles through Gezer until the shore of the Mediterranean. Joshua is in Gibeon which is located in the Judean mountain range. If at Gibeon Joshua is elevated about 2500 feet, he will be able to see westward about 58 miles before the Earth's curvature limits his line of vision.[52] In order to be above the Aijalon Valley in Joshua's line of vision, the moon would be just about 10-30 degrees above the horizon. In fact, the higher Joshua's elevation at Gibeon, the lower in the sky the moon must be in order to be above the Aijalon Valley. If Joshua is seeing the moon about 30 or so degrees above the horizon, then the moon is about 60 degrees from the sun, and the sun is at the 90 degree mark, "in the midst of the sky." At this angle, the moon would not be in full phase, but between the 3rd quarter and full phase, but closer to the former. In the 3rd quarter, the moon is in the middle sky as the sun rises, and it sets in the west when the sun reaches the middle sky. Hence, since Joshua can still see the moon while the sun is in the middle of the sky, the moon's phase must be just prior to the 3rd quarter. All in all, the account conforms with astronomical facts concerning the occupation of the sun and moon in the midday sky.

Additionally, the passage's veracity is also demonstrated in that it fulfills the required testimony of the Hebrew legal code, *i.e.*, "two or three witnesses."[53] Among the witness are "The Book of Jashar" and the Hebrew Bible. The Book of Jashar is cited because it will serve to stem any doubts about the account's authenticity, since the passage itself admits that the stopping of the sun and moon is one of the most fantastic events ever to occur in the history of mankind. To at least affirm that a second party recorded such an occurrence, anyone familiar at that time with the Book of Jasher could consult the text to authenticate the testimony of the Hebrew Bible. Whether the Book of Jashar exists today is still in debate,[54] but the fact remains that the Hebrew writer puts his testimony of the miraculous event on the line, as it were, allowing it to be checked and verified by any independent party who sought an affirming witness. The *Book of Jashar* is itself authenticated since it is cited in other books of the Hebrew Bible, and thus the veracity of the reference to Jashar in the book of Joshua is affirmed.[55] (There are other such books that are not included in the canonical corpus of the Hebrew Old Testament, such as the book of Gad the Seer – 1Ch 29:29).

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[52] If he is elevated at 3000, he can see for 64 nautical miles. See http://www.boatsafe.com/tools/horizon.htm.

[53] Dt 17:6; 19:15; Mt 18:16; 2Co 13:1.

[54] Some orthodox Jews assert that the *Book of Jashar* appears in two ancient rabbinical works and an anonymous Jewish work of the 12th century A.D. The actual title of the book is ספר הישׁר (sefer hayashar) translated more correctly as "Book of the Righteous." The Hebrew article ה is never put before a proper name,

To round out a possible “third witness” to the event, the Hebrew Bible reiterates the account of the cessation of celestial movement in Habakkuk 3:11: “The sun and moon stood still in their habitation at the light of thine arrows as they sped, at the flash of thy glittering spear.” Habakkuk reflects the detail of the Joshua passage in that it mentions both the sun and the moon ceasing their movements. The book of Habakkuk was written in the 7th century B.C. while Joshua was written in the 11th century, thus showing how the tradition survived intact over at least four centuries. Additionally, the event is also recorded in Ecclesiasticus (Sirach) 46:4: “Was not the sun held back by his hand? And did not one day become as long as two?” This Old Testament book was written just prior to the Maccabean revolt, circa 160 B.C., which makes the testimony of Joshua’s Long Day endure at least through a millennium.

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thus “Jashar” is probably a misnomer in today’s Bibles. The citation often given for the account in Joshua 10:12-14 is: Yashar 88:63-65, which reads: “[63]And when they were smiting, the day was declining toward evening, and Joshua said in the sight of all the people, Sun, stand thou still upon Gibeon, and thou moon in the valley of Ajalon, until the nation shall have revenged itself upon its enemies. [64]And the Lord hearkened to the voice of Joshua, and the sun stood still in the midst of the heavens, and it stood still six and thirty moments, and the moon also stood still and hastened not to go down a whole day. [65]And there was no day like that, before it or after it, that the Lord hearkened to the voice of a man, for the Lord fought for Israel” (taken from a 1613 A.D. book, J. H. Parry and Co. Salt Lake City, 1887). Another source, *The Book of Jasher* (New York, M. M. Noah and A. S. Gould, 1840, p. 260), says that the word “moments” is from the Hebrew “עתים, literally times; what portion of time, I cannot understand by this term, never used in scripture to express any division of time, so I have translated it ‘moments,’” as cited in *The Long Day of Joshua*, Donald Patten, Ronald Hatch and Loren Steinhauer, Pacific Meridian Pub., WA, 1973, p. 183). Nh 9:28 & Jb 24:1 use עתים (“times”) from the feminine noun עת. (See also http://www.kivits.com/Jashar1.htm). One source, Timothy Archer, claims that “Sefer haYashar” was found in the Qumram excavations, although only the account found in 2Sm 1:18, not Joshua 10:10-14. Please see the website at: (http://www.strangehorizons.com/2003/20030317/jashar.shtml).

[55] 2Sm 1:18, although in this account the demise of Israel is recorded.

Exegetical Details of Joshua 10:10-14

Similar to a few other accounts in the Old Testament, celestial bodies are incorporated into accounts of war in one form or another. The closest to Joshua is Judges 5:20: "From heaven fought the stars, from their courses they fought against Sisera." From the metaphorical wording embedded in the passages, some scholars have concluded that Js 10:10-14 is merely a fictional account of a typical battle in the annals of Israeli history. In their view, the account is merely an embellished story that attributes a decisive victory to the Hebrew God but in reality it was a normally fought battle that lasted at least two days. These scholarly conclusions, of course, discount any divine intrusion taking place in the narrative, which is their academic goal when interpreting such miracle-laden passages. The difficulty for these scholars, however, is that the miraculous intrusion is woven so inextricably within the details of the passage that it is impossible to separate them without destroying the history of the narrative itself. After the "Quest for the Historical Jesus" was undertaken by liberal scholars in the last few centuries, theological academia became quite aware of the fact that arbitrarily separating the miraculous from the historical results in destroying both. This has been the Achilles heel of most of liberal and modernistic scholarship when examining passages such as Joshua 10:10-14.

There are other interpreters who, although recognizing the validity of miracles, seek to minimize the possibility that such events occurred in Joshua 10, usually out of fear of criticism from modern academia. In such cases, appeal is often made to the Hebrew word דמם (*damam*) that appears in reference to the sun: "And the sun *stood still*." Since *damam* also means "silent,"[56] these interpreters posit that Joshua is not saying the sun was moving and then stopped; rather, "silent" is merely a poetic way of describing Israel's victory over the Amorites using celestial metaphors, as if the sun was hushed with amazement.

But escape from the literal application is not so easy. Although in many cases "silent" is the preferred translation of *damam*, in actuality, *damam* is chosen because it always ceases the action of the entity in view. For example, if a person is talking, *damam* is used to denote that he has ceased talking, and therefore he is "silent" (*e.g.*, Ps 31:17: "let the wicked be put to shame, let them *be silent* in Sheol"). If an object is moving, *damam* is used to denote that it has stopped its motion (*e.g*., 1Sm 14:9: "Wait until we come to you, then we will *stand still* in our place, and we will not go up to them"). Whatever the normal activity of the entity in view, *damam* is employed when that activity comes to an end. Hence, if the salient feature of the sun is its movement in the sky so that it can give light upon the land (which function will eventually terminate if the sun moves beyond the immediate locale), *damam* would be the proper word to use if the sun's movement ceased.

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[56] דמם (*damam*) appears 30 times in the Old Testament (RSV), and is understood in the following ways: "silent" (Lv 10:3; Jb 29:21; 31:34; Ps 4:4; 30:12; 31:17; 62:5; 131:2; Jr 47:6; 48:2; Lm 2:10; Ez 24:17; Am 5:13); "cut off" (1Sm 2:9); "stand still" (1Sm 14:9) "still" (Ex 15:16; Jb 30:27; 37:7; Is 23:2; Jr 8:14); "ceasing" (Ps 35:15); "devastated" (Jr 25:37); "destroyed" (Jr 49:26; 51:6); "rest" (Lm 2:18).

Although after Joshua *damam* is not used again in the Hebrew Bible in connection with a heavenly body, it is used with other objects whose chief function is movement. In Jr 47:6, for example, *damam* is used to represent the cessation of a sword's activity: "Ah, sword of the Lord! How long till you are quiet? Put yourself into your scabbard, rest and *be still*!" We know that the salient feature of the sun in Joshua 10:13 is its movement across the sky to give light (as opposed to its heat), for the simple fact that it is coupled with the movement of the moon: "And the sun stood still, and the moon stayed." Hence, the use of *damam* in the case of the sun can only apply to a cessation of its movement, otherwise, it could not be compared to the moon. Moreover, although in the moon's cessation of movement the word chosen is עמד (*amad*),[57] in the latter part of Js 10:13 *amad* appears again to describe the sun's cessation of movement: "The sun stayed (*amad*) in the midst of heaven." Thus, the sun's cessation of movement is reinforced by two similar yet distinct Hebrew words, *damam* and *amad*.

Additionally, two different Hebrew tenses are employed. After Joshua's use in *vr*. 12 of *damam* in the Qal imperative commanding the sun and moon to "stand still," in *vr*. 13 the narrator puts *damam* in the Qal imperfect tense to denote the sun did, indeed, heed the command. Normally, the imperfect tense is a future tense, but because it is introduced here with a *waw*-consecutive it acts like a past tense, thus *vr*. 13's translation, "stood still." Also in *vr*. 13, the narrator then changes verbs and tenses to describe the moon's cessation of movement, using *amad* in the perfect tense, which is the Hebrew past tense. Lastly, in *vr*. 14, the *Book of Jasher* is cited and now *amad* is applied to the sun in the Qal imperfect *waw*-consecutive. The upshot of all these grammatical nuances is that these Hebrew verbs and their alternating tenses show conclusively that the account is interwoven as a cause-effect sequence of events that actually took place as recorded. Poetry is never put in such a format.

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[57] עמד (*amad*) appears 78 times in the Old Testament. Its preponderant meaning is translated by such words as: "stay," "wait," "remain," "abide," "establish," etc., the most common being "stop" or "stay" (*e.g*., Gn 19:17; Ex 9:28; Lv 13:23; Dt 10:10; 1Sm 20:38; 30:9; 2Sm 17:17; 2Kg 4:6; 13:18; 15:20; Jr 4:6; Hs 13:13).

Some claim that *vr*. 13's wording, "The sun stayed in the midst of heaven, and did not hasten to go down for about a whole day," shows by the words "go down" that the passage is using phenomenological language since, in the geocentric system the sun doesn't actually go down, rather, it circles the Earth and the sun only appears as if it is going down against the Earth's horizon.[58] This argument is falsified by the fact that the original Hebrew does not use the word "down," but only "go."[59]

Once divine intrusion is accepted as the basis for the account, another issue for consideration is whether the sun itself was stopped (which necessitates that it was previously in motion) or the Earth was stopped in rotation (which necessitates that the sun was not in motion). The most significant piece of evidence in favor of the former interpretation is that even modern heliocentric science (which holds that the Earth rotates on an axis and revolves around the sun), agrees that the moon moves in space. It revolves around the Earth every 28 days or so. That being the case, if behind the actual meaning of Joshua 10:10-14 were the possibility that the Earth was in rotation and thus the passage is attempting to give a phenomenal or 'as it appears' account of the events occurring on that historic day, it would be rather self-defeating for the author to include the cessation of the moon's movement, since both the ancient and modern observer agree that since the moon revolves around the Earth it must be stopped from doing so if it is to be legitimately considered ceasing its movement. Consequently, since in the normal course of events the moon is in constant motion, yet on this particular day its movement ceased, we are forced to conclude that the cause for the moon's cessation of movement was not the Earth that stopped spinning but a force that acted upon both the moon and the sun to stop them from continuing their normal revolution around the Earth. So conspicuous is the moon in this account that the reader may assume that the writer deliberately added the moon so as to forestall interpretations of the passage that might seek to eliminate its literal interpretation. The reason is plain: in the heliocentric system, the Earth rotates, and whereas if the Earth stopped rotating it would make it appear as if the sun stood still, the moon would still revolve around the Earth and appear to be continuing to move while the sun remained still, and thus Joshua's request could not be fulfilled by ceasing the Earth's rotation.[60] Once again, since in the geocentric system both the sun and the moon revolve around the Earth, then both the sun and the moon would need to cease their movement simultaneously to satisfy Joshua's request. As noted previously, the heliocentric system, with its claim of a cessation of the Earth's rotation, cannot satisfy Joshua's request, for from Joshua's perspective on the ground the moon would simply move too far in one day to fulfill the specification in the text that it remained over the valley of Aijalon, which at most stretches for only 15 miles until it hits the Mediterranean Sea.

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[58] Argued by David Palm in "Pope Leo XIII On Literal Interpretation and the Unanimous Consent of the Fathers," at http://www.galileowaswrong.com.

[59] ולא־אץ לבוא כיום תמים ("and did not hasten to go for a whole day") wherein the word in question (לבוא) does not mean "to go down" but "to go." It is a combination of the Hebrew prefix ל ("to") and the root word בוא ("go," "come," "bring"). As such, the passage is entirely literal, since the phrase in question is not speaking of the direction of the sun but only the movement of the sun.

Historical Evidences for Joshua's Long Day

Several works have sought to corroborate the biblical account of Joshua's long day with other historical accounts in various parts of the world. One source makes the following points:

> In the ancient Chinese writings there is a legend of a long day. The Incas of Peru and the Aztecs of Mexico have a like record, and there is a Babylonian and a Persian legend of a day that was miraculously extended. Another section of China contributes an account of the day that was miraculously prolonged, in the reign of Emperor Yeo. Herodotus recounts that the priests of Egypt showed him their temple records, and that there he read a strange account of a day that was twice the natural length.[61]

Another account is similar:

> In the Mexican Annals of Cuauhtitlan (the history of the empire of Culhuacan and Mexico, written in Nahua-Indian in the sixteenth century) it is related that during a cosmic catastrophe

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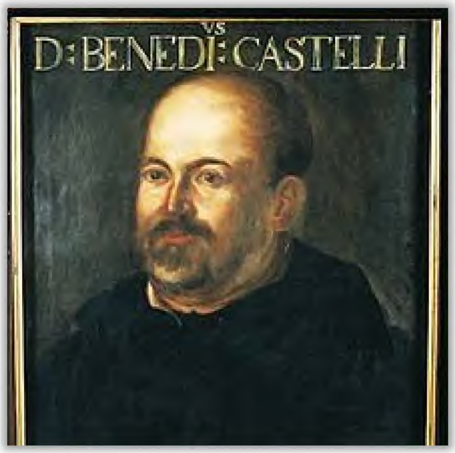
[60] The distance from the Earth to the moon is 250,000 miles. Using $2\pi r$ for the circumference of the moon's orbit, the total is 1,570,000 miles the moon travels in 28 days. In one day it travels 56,071 miles, which distance would take it way beyond the valley of Aijalon. In fact, since the Joshua account says that both the sun and the moon could be seen in the sky, this means that the sun and moon were at right angles to one another with the moon being near the extremity of the horizon. That being the case, there is a slim margin of space the moon could occupy in order to remain in the sky if its movement had not been arrested. An extra distance of 56,000 miles would take it beyond the horizon and out of sight.

[61] Harry Rimmer, *The Harmony of Science and Scripture*, Eerdmans Publishing Co., 1944, pp. 269-270.

> that occurred in the remote past, the night did not end for a long time....Sahagun, the Spanish savant who came to America a generation after Columbus and gathered the traditions of the aborigines, wrote that at the time of one cosmic catastrophe the sun rose only a little way over the horizon and remained there without moving; the moon also stood still.[62]

Galileo's Interpretation of Joshua 10
The Letter to Castelli

On December 21, 1613, three years after Galileo had published his formal advocacy of heliocentrism in his book *Siderius nuncius*, he was busy defending his theory in various private letters. One of the more extensive defenses appears in his letter to his personal friend, **Benedetto Castelli**. In the letter, Galileo gives two answers to Joshua 10:10-14. In the first he claims that it is not necessary or always correct to interpret Scripture in a literal sense. In the second, Galileo claims that even if one were to interpret the passage literally, it is impossible to explain from the geocentric position. Thus he attempts to explain it from the heliocentric model, which we will analyze here.



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[62] Immanuel Velikovsky, *Worlds in Collision*, New York, Macmillan Company, 1950, pp. 45-46. See also *Joshua's Long Day and the Dial of Ahaz*, C. A. L. Totten, Destiny Publishers, MA, 1890, p. 25. The most extensive treatment of the historical coincidences is Gerardus Bouw's, *Geocentricity*, pp. 60-80, which documents incidents occurring during the same time period in Africa, China, North America, Central and South Americas.

Galileo writes:

> (1)…I come now to a consideration of the particular passage from Joshua which occasioned three comments to the Grand Duchess. And I will seize upon the third, which was presented as mine, as indeed it truly is. But I will add for you some further considerations which I do not believe have been put in writing previously.[63]
> (2) Let it be granted and conceded to an adversary for now that the sacred text should be taken in its exact literal meaning; namely, that God was asked by Joshua to make the sun stand still and to prolong the day so that he could obtain the victory. And I also ask my adversary to observe the same rule that I observe, that is, that he not bind me but free himself in regard to altering or changing the meaning of the words. I say, then, that this passage most clearly shows the falsity and impossibility of the Aristotelian and Ptolemaic world system, and is also very well accommodated to the Copernican system.
> (3) First I ask my adversary if he knows by what motions the sun is moved. If he knows, he must reply that the sun has two motions; namely, an annual motion towards the east and a daily motion towards the west.
>
> (4) Next ask him whether both of these motions, which are different and contrary to each other, belong to the sun and are both proper to it. He must reply "no," for the only proper and special motion of the sun is its annual motion. The other motion is not proper to it, but belongs to the highest heaven, that is, the first sphere, which in its rotation carries along the sun and the other planets and the stellar sphere and which is ordained to give a revolution* around the earth in twenty-four hours by means of a motion, as I have said, which is contrary to the sun's natural and proper motion.
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> (5) I come then to the third question, and I ask him which of these two motions of the sun causes day and night; namely, its

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[63] Original Italian: "In confermazione di che, vengo adesso a considerare il luogo particolare di Giesuè [Joshua], per il quale ell' apportò ad alcuni tre dichiarazioni; e piglio la 3^{a}, ch' ella produsse come mia, sì some veramente è, m'v' aggiongo alcune condizioni di più, quale non credo haverle detto altra volta" (Favaro, *Galileo E L'Inquisizione*, p. 42). For the rest of Galileo's letter to Castelli we will use the English translation.

own proper and real motion, or the motion of the first sphere. He must reply that day and night are caused by the motion of the first sphere, and that the proper motion of the sun does not produce day and night but rather the various seasons and the year itself.

(6) Now if the day depends not on the motion of the sun but on the motion of the first sphere, who does not see that, in order to lengthen the day, one needs to make the first sphere stop, and not the sun? Thus if someone understands these first elements of astronomy, does he not also recognize that if God had stopped the motion of the sun, then instead of lengthening the day, he would have shortened it and made it briefer? For since the motion of the sun is contrary to the daily revolution*, then to the degree that the sun moves towards the east, to the same degree it will be slowed down in its motion towards the west. And if the motion of the sun is decreased or annulled, it will move to the west in a proportionally shorter time. This is observable if one looks at the moon, whose daily revolution* is slower than that of the sun in proportion to its own proper motion being faster than that of the sun. Therefore it is absolutely impossible in the system of Ptolemy and Aristotle to stop the motion of the sun and thereby to lengthen the day, as the Scripture states to have happened. Hence either one must say that the motions are not arranged as Ptolemy said, or one must alter the meaning of the words, and say that, when the Scripture says that God stopped the sun, he really wished to say that he stopped the first sphere. But in order to accommodate himself to the capacity of those who are hardly able to understand the rising and setting of the sun, he said the contrary of what he ought to have said as he spoke to humans steeped in the senses.

(7) Let me add that it is not credible that God would have stopped the sun without paying attention to the other spheres. For without any reason he would have changed all the laws, relations, and dispositions of the other stars in respect to the sun, and would have greatly disturbed the whole course of nature. But it is credible that he stopped the whole system of celestial spheres which, after an intervening period of rest, he returned consistently to their functions without any confusion or alteration.

> (8) But since we have already agreed not to alter the meaning of the words of the text, we must have recourse to another arrangement of the parts of the world, and then see if it agrees with the bare meaning of the words, taken straightforwardly and without hesitation, as to what actually happened.
>
> (9) Now I have discovered and have proven with necessity that the globe of the sun rotates on itself, making one full rotation* in about one lunar month, in exactly the same way that all the other celestial rotations occur. Moreover it is quite probable and reasonable that the sun, as the instrument and highest minister of nature, as if it were the heart of the world, gives not only light, as it clearly does, but also motion to all the planets which revolve around it. Therefore, if in agreement with the position of Copernicus we attribute the daily rotation primarily to the earth, then who does not see that, in order to stop the whole system without any alteration in the remaining mutual relation of the planets but only to prolong the space and time of the daylight, it is sufficient to make the sun stop, exactly as the literal meaning of the sacred text says? Behold then that in this second way it is possible to lengthen the day on earth by stopping the sun, without introducing any confusion among the parts of the world and without altering the words of Scripture.
>
> (10) I have written much more than my indisposition allows. So I will end, offering my services and kissing your hands, petitioning Our Lord for a good holiday and every happiness. Florence, 21 December 1613.[64]

There are several problems with Galileo's arguments. First, Galileo enters the challenge by saying: "the sacred text should be taken in its *exact literal meaning*; namely, that God was asked by Joshua to make the sun stand still." But his interpretation: "if in agreement with the position of Copernicus we attribute the daily rotation primarily to the earth," is not an "exact literal meaning," since Joshua 10:10-14 does not mention the Earth, much less its ceasing of an alleged rotation. The original Italian does not leave much room for Galileo. It states: "…che le parole" ("that the words") "de testo sacro" ("of the sacred text") "s'habbino a prendere nell'senso appunto" ("should be taken in the sense exactly") "che elle suonano" ("that they play out").[65] The only latitude for Galileo is the Italian word *suonono*. It is the third person, plural, present, indicative of the verb *suonare*, which means to play, make music, or chime, ring, beat, sound or seem. If Galileo intended *suonano* as a metaphor for music, he gave himself some leeway regarding what he meant by "the exact sense" of Joshua's text, since he could have meant that whatever interpretation sounds the best is the most proper, that is, the interpretation that best fits the biblical data is what was intended by Joshua. This leeway would allow Galileo to suggest a rotation of the Earth as the proper interpretation since, in his mind, it best "plays out" or "rings true" the available data. But that which best "plays out" the data is in Galileo's case determined by the subjective judgment of the interpreter and is not dependent strictly on a literal rendering of the words. If the literal words say "the sun stopped," then the literal interpretation must incorporate the fact that the sun was moving and suddenly came to a stop. There can be no other literal sense to the words. It is only when one arbitrarily adds the possibility of the 'language of appearance' that it would be possible to claim that the Earth stopped rotating. But using phenomenal language is neither literal language or literal interpretation, it is figurative on both counts. This distinction is true regardless how literal one makes the figures, that is, it is true in spite of Galileo's attempt to use a literal rotation of the Earth to attempt to answer the figurative stoppage of the sun.

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[64] Translated by Richard Blackwell in *Galileo, Bellarmine and the Bible*, pp. 199-201. Blackwell's use of "rotation" and "revolution" have been corrected when necessary and are noted by an asterisk.

Ironically, Galileo reiterated his commitment to the literal meaning of Joshua 10 in paragraph #8 in which he says: "But since we have already agreed not to alter the meaning of the words of the text." The original Italian is: "Ma perchè siamo già convenuti, non dover alterare il senso litterale del testo." A more literal translation of the second half of the sentence is: "not to alter the literal sense of the text." Normally, the "literal sense" is understood to refer to what the words literally say. There is no "meaning" other than the literal data, no matter how absurd it may sound or impossible to accomplish. If, for example, one said: "I jumped to the moon," the only literal sense is that the person squatted down and sprang up with enough force to land him on the moon. Although in this case the literal sense is certainly impossible to accomplish, still, the sentence can only refer to one action, jumping to the moon. Similarly, "stopping the sun," in the literal sense, can only mean stopping the sun from moving in space. Hence, it seems as though Galileo has limited his options in paragraph #8 and thus he has not followed the rules of his own challenge.

Secondly, Galileo complains that the Ptolemaic or Aristotelian models would have an impossible task of accomplishing the stoppage of the sun because the sun has two movements in the sky, one in which the sun itself actually moves and one in which the sphere housing the sun moves. In the latter, the sun only appears to move, according to Galileo. The former is the annual west-to-east movement of the sun as it makes its 360 degree trek through the zodiac, while the latter is the daily east-to-west movement we see in sunrise and sunset. He writes in paragraph #6:

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[65] Favaro, *Galileo E L'Inquisizione*, p. 42, my translation.

> For since the motion of the sun is contrary to the daily revolution,* then to the degree that the sun moves towards the east, to the same degree it will be slowed down in its motion towards the west. And if the motion of the sun is decreased or annulled, it will move to the west in a proportionally shorter time.

Galileo claims that, if one is going to interpret Joshua 10 literally, ceasing the sun's movement can only refer to what he deems as the *actual* movement of the sun, the west-to-east movement that it makes against the revolving universal sphere. His argument is that if the "actual" movement of the sun is stopped, it does not lengthen the day, it actually makes it shorter, since: (a) the motion of the universal sphere which carries the sun in its daily revolution has not been stopped and therefore the sun will move at its normal 24-hour pace around the Earth, and (b) the ceasing of the sun's west-to-east movement through the zodiac will make the sun move a little faster in the east-to-west direction, thus defeating Joshua's whole purpose for calling upon God.

Galileo's argument is clever, but it is wrong on all counts. First, the conundrum Galileo manufactures for the geocentric model is accomplished by an arbitrary mixing of the miraculous and the natural. On the one hand, Galileo admits to the miraculous nature of stopping the west-to-east movement of the sun because for him it answers the literal interpretation of Joshua's request. On the other hand, for the sun's east-to-west movement Galileo suddenly wishes to limit the possibilities to the natural realm, thus allowing himself to claim that there would be a contradiction in the geocentric explanation of Joshua 10. Thus in paragraph #7 he writes:

> Let me add that it is not credible that God would have stopped the sun without paying attention to the other spheres. For without any reason he would have changed all the laws, relations, and dispositions of the other stars in respect to the sun, and would have greatly disturbed the whole course of nature.

But as Galileo was warned by Pope Urban VIII in 1633, and as even the converted Galileo himself realized in 1641 when he renounced the heliocentric system,[66] God's omnipotence has no limits. There are innumerable ways God can accomplish the task at hand if and when the normal laws which govern the universe are set aside to make room for God's divine ingenuity.

Second, Galileo conveniently ignores the fact that, if the sphere moves then the sun moves, and if the sphere stops then the sun stops. In contrast to a fixed earth, there is movement and cessation of movement for both the sphere and the sun. For example, as the axle in a wheel rotates 360 degrees at the same time as the rim of the wheel, both the axle and the rim move in relation to the fixed vehicle to which they are housed. In addition, the fact that the moon also ceases its motion and hangs over the valley of Aijalon for close to 48 hours lends credence to the idea that both the sun and the moon are housed in the same sphere. In other words, to stop both the sun and the moon simultaneously, only the sphere in which they are contained needs to be stopped. Hence it is literally true that both the sun and the moon could be stopped, and thus Joshua's request is literally fulfilled. Galileo's attempt to apply the distinction between the sun's proper and improper motion to the literal interpretation of Joshua 10 is obviously erroneous.

Galileo had another argument to counter the traditional interpretation of Joshua 10. In his *Letter to the Grand Duchess Christina* of July 1615, he states:

> But if I am not mistaken, something of which we are to take no small account is that by the aid of this Copernican system we have the literal, open, and easy sense of another statement that we read in this same miracle, that the sun stood still *in the midst of the heavens*. Grave theologians raise a question about this passage, for it seems very likely that when Joshua requested the lengthening of the day, the sun was near setting and not at the meridian. If the sun had been at the meridian, it seems improbable that it was necessary to pray for a lengthened day in order to pursue victory in battle, the miracle having occurred around the summer solstice when the days are longest, and the space of seven hours remaining before nightfall being sufficient. Thus grave divines have actually held that the sun was near setting, and indeed the words themselves seem to say so: *Sun, stand thou still, stand thou still.* For if it had been near the meridian, either it would have been needless to request a miracle, or it would have been sufficient merely to have prayed for some retardation. Cajetan is of this opinion, to which Magellan

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[66] See Volume I, Chapter 1 of *Earth: Motionless in the Center of the Universe.*

> [Cosme Magalhaens] subscribes, confirming it with the remark that Joshua had already done too many things that day before commanding the sun to stand still for him to have done them in half a day. Hence they are forced to interpret the words *in the midst of the heavens* a little knottily, saying that this means no more than that the sun stood still while it was in our hemisphere; that is, above our horizon. But unless I am mistaken we may avoid this and all other knots if, in agreement with the Copernican system, we place the sun in the "midst" – that is, in the center – of the celestial orbs and planetary rotations, as it is most necessary to do. Then take any hour of the day, either noon, or any hour as close to evening as you please, and the day would be lengthened and all the celestial revolutions stopped by the sun's standing still *in the midst of the heavens*; that is, in the center, where it resides. This sense is much better accommodated to the words, quite apart from what has already been said; for if the desired statement was that the sun was stopped at midday, the proper expression would have been that it "stood still at noonday," or "in the meridian circle," and not "in the midst of the heavens." For the true and only "midst" of a spherical body such as the sky is its center.[67]

Again, Galileo's interpretation is illogical. If the sun were already in the "midst of heaven" by the mere physical fact that it occupies the center of the solar system, then there would be no reason for Joshua to associate the "midst of heaven" with the cessation of movement. Joshua 10:13 says: "And the sun stood still, and the moon stayed….The sun stayed in the midst of heaven, and did not hasten to go down for about a whole day." Stating that the sun was "stayed in the midst of heaven" but with no relation to a cessation of its movement would be superfluous since, in the Copernican system, the sun already occupied the center of the heavens and has never ceased doing so. Moreover, Galileo ignores the impact of the moon on the interpretation of the passage. By using the moon as a reference marker, the passage is defining movement and cessation of movement. That is, a celestial body is in motion before Joshua's command and ceases said motion after his command. If motion and direction toward the horizon is defined and accomplished for the moon, it must also be the same for the sun, otherwise the passage is inconsistent and incongruous. Since in this case the moon must precede the sun in their mutual heading toward the horizon, the moon must stop at some place before it hits the horizon, which means the sun must be some distance further back. The only scientific possibility for that location is in the middle of the day sky or before the midday sky.

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[67] Translated by Stillman Drake in *Discoveries and Opinions of Galileo*, pp 213-214.

Additionally, Galileo is led to his peculiar interpretation because he cannot fathom why Joshua would ask for the sun to cease its travel across the sky at noon time if he could expect at least another half day of sun light to accomplish his task. But although Joshua's request may seem odd from a chronological perspective, it is quite appropriate from a logistical perspective. As we noted earlier, Joshua has no small task on his hands. Five armies surrounded him on this particular day. If after defeating the first army Joshua calculated how long it took to accomplish, he could then calculate how long it would take to defeat the other four armies. Apparently, by midday Joshua had calculated that the job could not be done in the remaining six to nine hours of light available to him. Even at four hours per army (which is a modest estimate considering that battles between two armies, both ancient and modern, might extend into days or weeks rather than hours), the total time of Joshua's battles would extend beyond twenty hours. An extra day would give Joshua another twenty-four hours in addition to the six or nine he had remaining on the first leg of the battles, making a total of thirty to thirty-three hours of battle time to be divided up among five armies, amounting to between six or seven hours per army, which is not an exorbitant amount by any militaristic standards. If we add in the fact that noonday light is much brighter than sunset light and therefore much easier for Joshua to spot the enemy as opposed to having the enemy hiding in dark hues and shadows, it is all the more conducive for him to stop the sun at midday. Also, the heat of the noonday sun would allow no reprieve for the tired and exhausted bodies of an enemy pursued by divine hailstones, whereas the coolness of a setting sun would give them much needed comfort.

Ecclesiasticus (Sirach) 46:3-5

> [3]Who before him ever stood so firm? For he waged the wars of the Lord.
> [4]Was not the sun held back by his hand? And did not one day become as long as two?
> [5]He called upon the Most High, the Mighty One, when enemies pressed him on every side.

Here we have another witness to the events which occurred twelve hundred years earlier in the days of Joshua. It confirms that the sun was the moving object that needed to be stopped so that Joshua could complete his task. It confirms that the potential threat comprised a host of surrounding armies who were seeking to trap the Israelites. (Js 10:5 indicates that five kings, each with their separate army, sought to destroy Israel). Sirach puts the information into a series of rhetorical questions, which is his way of indicating that these events are established historical facts that only a fool would deny.

Habakkuk 3:11

> [11]The sun and moon stood still in their habitation at the light of thine arrows as they sped, at the flash of thy glittering spear.

The outstanding grammatical feature in this passage is the consistent use of Hebrew singulars, even though there are two celestial bodies in view. First, the lack of a conjunctive between "sun" and "moon" acts as a singular; second, the verb "stood still" (which uses the same word עמד (*amad*) utilized in Js 10:12-13) is in the singular; third, "habitation" is also in the singular. The purpose of the singulars is to treat the occurrence as one celestial phenomenon, perhaps because both the sun and moon ceased their motion as the universe at large stopped revolving altogether.

The recapping of the events of Joshua's time are contextually significant here because it serves to remind the prophet Habakkuk of God's mighty deeds of the past so that Habakkuk can have confidence that God will do the same in the present dire situation at hand. The book of Habakkuk is only three chapters long, but the drama is very intense. The outline is as follows:

- Hk 1:1-1-4: Habakkuk's first question to God: Why do the evil Israelites go unpunished?
- Hk 1:5-1:11: God's answer to Habakkuk: I will use the evil Babylonians to punish them.
- Hk 1:12-2:1: Habakkuk's second question: Why are you using an evil nation to judge Israel?
- Hk 2:2-2:20: God's answer: I will also judge the Babylonians after I use them to judge Israel.

- Hk 3:1-19: Habakkuk remembers all of God's mighty deeds and judgments of the past and has his faith restored.

It is within the last pericope that Habakkuk recounts a number of God's previous mighty deeds, among them being the destruction of Cushan and Midian (Ex 15:14-16) as well as the plagues upon Egypt and Canaan (Ex 7:19-20; Js 3:16). These are historical events that serve to authenticate God's actions and confirm his promises to Habakkuk that He will bring the same vengeance upon Israel's present oppressor, Babylon. Hence, because the miraculous celestial event of Joshua's day is called upon as a testimony to God's faithfulness, the event is authenticated as a real historical occurrence, otherwise the very attribute of divine faithfulness that Habakkuk is seeking to exonerate would be built on false testimony.

2 Kings 20:9-12

> [9]And Isaiah said, "This is the sign to you from the Lord, that the Lord will do the thing that he has promised: shall the shadow go forward ten steps, or go back ten steps?"
> [10]And Hezekiah answered, "It is an easy thing for the shadow to lengthen ten steps; rather let the shadow go back ten steps."
> [11]And Isaiah the prophet cried to the Lord; and he brought the shadow back ten steps, by which the sun had declined on the dial of Ahaz.
> [12]At that time Merodachbaladan the son of Baladan, king of Babylon, sent envoys with letters and a present to Hezekiah; for he heard that Hezekiah had been sick.

2 Chronicles 32:31

> [31]And so in the matter of the envoys of the princes of Babylon, who had been sent to him to inquire about the sign that had been done in the land, God left him to himself, in order to try him and to know all that was in his heart.
> [32]Now the rest of the acts of Hezekiah, and his good deeds, behold, they are written in the vision of Isaiah the prophet the son of Amoz, in the Book of the Kings of Judah and Israel.

Isaiah 38:7-8

> [7]"This is the sign to you from the Lord, that the Lord will do this thing that he has promised:
> [8]Behold, I will make the shadow cast by the declining sun on the dial of Ahaz turn back ten steps." So the sun turned back on the dial the ten steps by which it had declined.

Together these three passages (2Kg 20:9-12; 2Ch 32:31; Is 38:7-8) are important because they specify the same occurrence and treat it as a miraculous event. Not only was the event known in Israel, but the king of Babylon had also heard and thus sent envoys to make an inquiry of the "sign." Similar to the account in Joshua in which two or three witnesses are included in order to authenticate the event as a real occurrence, so here we have the authors of Kings, Chronicles and Isaiah all testifying to the same miraculous event, with a foreign king as an internal witness to the three narratives.

The passages are also significant because they demonstrate that, of the two possible means to turn back the time which was displayed on the sundial of Hezekiah, it is the sun that is turned back in its course, not the Earth which is retarded in rotation. Indeed, Scripture knows nothing about a rotating Earth in order for it to be considered an option in a matter of celestial adjustment. If the Earth were rotating, there would be little reason for the narrator not to mention that it had been retarded by ten steps, since such a rotational reversal would have been just as stupendous as turning back the sun in its course. In fact, considering the disturbances and vibrations a sudden reversal of the Earth's rotation would have caused, it would have been more miraculous to mask such terrestrial effects than it would be for a curtailing of the sun's movement.

Psalm 8:3-6

> [3]When I look at thy heavens, the work of thy fingers, the moon and the stars which thou hast established;
> [4]what is man that thou art mindful of him, and the son of man that thou dost care for him?
> [5]Yet thou hast made him little less than God,[68] and dost crown him with glory and honor.

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[68] Hebrew here is אלהים (elohim), often translated as "God," but can also refer to angles. RSV, ASV, NAS, NRS translate it here as "God," the KJV and DR as "angels," the NIV as "heavenly beings."

> [6]Thou hast given him dominion over the works of thy hands; thou hast put all things under his feet

There is no explicit geocentric information in this Psalm, but the "establishment" of the moon and the stars requires an explanation from the geocentrist in light of the fact that the same word, "establishment" (Hebrew: *kun*) is used of the Earth in passages such as Ps 96:10: "Yea, the world is established, it shall never be moved." If the moon and stars move but the Earth does not, why is the same word "establishment" being used for all three? First we see that Ps 96:10 adds the key phrase that specifies the Earth's immobility ("it shall never be moved"), a phrase that Scripture never applies to the moon, stars or sun. Second, all scientific parties agree that the moon moves, and thus the use of *kun* in this verse is in the more general sense of the Hebrew word.[69] Third, the verbal form of *kun* (כוֹננתה) is chosen specifically for this Psalm. It is a polel perfect in the masculine singular. This is somewhat of a grammatical oddity since the singular is followed by the plural "stars" that is also coupled with the "moon."[70] The oddity is explained by the fact that the singular verb is treating the multitudinous heavenly bodies (the moon and plurality of stars) as one mechanized unit. The intensive verbal form, the polel perfect, is for the purpose of indicating that God has so perfectly measured the distances, motions, and places of the heavenly bodies in the cosmos that they all act as one giant clock with each part functioning precisely as planned and without fail. It is this precision about which the Psalmist is marveling. Hence, the "establishment" of the moon and stars refers to their clockwork precision as they do their particular jobs in the cosmos; whereas the "establishment" of the Earth, due to the Psalmist's addendum that it does not move, refers to the Earth's centrality and immobility around which the moon and stars revolve.

Psalm 19:1-6

> [1]The heavens are telling the glory of God; and the firmament proclaims his handiwork.
> [2]Day to day pours forth speech, and night to night declares knowledge.

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[69] Hebrew כון (*kun*). See footnote on Ps 93:1 and Ps 96:10 for the definition and usage of *kun*.

[70] Hebrew: ירח (moon) וכוֹכבים (and the stars) אשׁר (which) כוֹננתה (you have established). Here the moon is without an article so it is more easily coupled with the stars as one unit.

> [3]There is no speech, nor are there words; their voice is not heard;
> [4]yet their voice goes out through all the earth, and their words to the end of the world. In them he has set a tent for the sun,
> [5]which comes forth like a bridegroom leaving his chamber, and like a strong man runs its course with joy.
> [6]Its rising is from the end of the heavens, and its circuit to the end of them; and there is nothing hid from its heat.
> [7]The law of the Lord is perfect, reviving the soul; the testimony of the Lord is sure, making wise the simple.

In the same familiar manner of Hebrew poetry that is characteristic of the Psalms, vr. 5 first speaks of the sun in metaphorical terms. It is compared to a bridegroom that comes out of his chamber, and a strong man running a race. The purpose of these descriptions is not for mere cosmetic value. These metaphors portray the images of tremendous energy and movement. In fact, there are few images that better represent single-minded determination and vigor than a bridegroom who seeks his bride and an athlete running a race. Both have strong desire firmly in mind and no concern or obstacle can bar them from their appointed goal. One would have to cripple or kill them in order to stop them. So strong are these images that, if the sun did not actually move in a circuit each day, there would be little reason for the Psalmist to employ the metaphors. In fact, the Psalmist uses five distinct words of movement to describe the sun's daily traverse – one describing the background against which the sun moves ("set a tent for the sun"), and four describing the sun's movement ("comes forth," "runs its course," "rising" and "circuit").

The addition of "there is nothing hid from its heat" is very significant, since it is a scientific fact that the sun radiates heat. Logically, one scientific fact deserves another. Hence, it follows that the sun's movement must also be a scientific fact, since it would be rather inconsistent to treat one aspect of the sun scientifically and the other unscientifically.

Although vr. 7 is sometimes regarded as the heading of the second section of the Psalm (vrs. 8-14), it is still an important foundation for the truths that are told in vrs. 1-6. The "testimony of the Lord is sure" in all cases. It would certainly be difficult to trust in what the Lord has to say about the spiritual things we cannot see if, indeed, he was not precise about the cosmological objects and movements we can see. In fact, looking back on history, we can safely say that a relativistic interpretation of the above verses has produced a relativism about Scripture in general, which has then led to a relativism of morals.

The accuracy of the account can be noted in the fact that there are only two options for the sun to complete its course. Either it refers to the heliocentric view that believes the sun is traveling around the Milky Way galaxy, or it refers to the geocentric model in which the sun travels around the Earth. Of the two options, we are confined to the latter, since the word "circuit" refers to the time span of one year.[71] In the heliocentric system, the sun travels around the galaxy only once in 250 million years, hence, in that case, the "circuit" of Ps 19:6 could not be completed. Only in the geocentric system wherein the sun travels around the Earth in the period of one year can the passage have any fulfillment and meaning. As it stands, the sun begins its year-long journey at one sign of the zodiac and completes it at the last sign. It is these two points that the Psalmist refers to when he says in vr. 6: "from the end of the heavens…to the end of them."

Of course, some may claim that the Psalmist is speaking "as it appears." Besides the fact that such an interpretation would make the strong imagery superfluous or inappropriate, other passages of Scripture that are more specific about the sun's and moon's movement (*e.g.*, Joshua 10:10-14) and the Earth's non-movement (*e.g.*, Ps 93:1; 96:9-10; 104:5,19) do not, in themselves, allow that option, at least on a grammatical-historical basis.

Some argue that "Psalm 19:1-6 speaks of the sun coming forth from its 'tent' and its 'rising' – again, admitted above to be phenomenological language."[72] This argument is falsified by the fact that Psalm 19:6 does not use the word "rising," although it appears in some English translations. The Hebrew reads: "From one end of the heavens is his going forth" from the Hebrew מקצה השמים מוצאו, in which the word מוצאו is "his going forth" not "his rising." Again, the passage is speaking about movement from one side of the heaven to the other, not a vertical rising. This meaning is confirmed by the second half of Ps 19:6 "and his orbit to their ends." The word "orbit" is the Hebrew ויקוכתו, which is from the root תקוכה ("coming around," "circuit," "orbit"). Thus there is nothing phenomenological about this passage. It speaks precisely the same way as Joshua 10:13.

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[71] תקופה (*tequphah*) appears four times in the Old Testament. The word literally means "the revolution of the year" (Ex 34:22: "and the feast of ingathering at the year's end"; 2Ch 24:23: "At the end of the year the army of the Syrians came"; 1Sm 1:20: "and in due time Hannah conceived"). Each of these usages is based on the time elapsed in a year.

[72] Argued by David Palm in "Pope Leo XIII On Literal Interpretation and the Unanimous Consent of the Fathers," at http://www.galileowaswrong.com.

Galileo's Interpretation of Psalm 19

In a letter to Monsignor Dini on March 23, 1615, Galileo offered an interpretation of Psalm 19 (Psalm 18 in the Vulgate and Douay-Rheims) that was designed to counter the interpretation of Cardinal Robert Bellarmine. Dini told Galileo that Bellarmine was adamant that Psalm 19 afforded no other interpretation than the sun revolving around the Earth. Galileo retorted with the following:

> Now I believe that the passage of the Psalms… "He proceeded as a bridegroom from his chamber and he exalted as a hero in running his course"…I would understand this to be said of the radiating sun, that is, of its light and the above-mentioned spirit which warms and fecundates all material substances and which is most quickly diffused throughout the whole world as soon as it leaves the body of the sun. Every word of the text fits this interpretation exactly. In the word "bridegroom" we have the power to reproduce and make fruitful. "Exalts" refers to the emanations of the sun's rays, which in a way occur by fits and starts, as the meaning clearly shows. "As a hero" or "as a strong man" denotes the efficacious power and activity of penetrating all bodies, together with the highest velocity of motion through immense spaces, for light emanates as though it were instantaneous. The words, "he proceeds from his chamber," confirm that his emanation and motion should be attributed to the light of the sun and not to the body of the sun itself. For the body and globe of the sun is the recipient and "like a chamber" for that light, and it would not be good to say that "the chamber proceeds from a chamber." In what follows, "his progress is from the highest heavens," we have the first derivation and separation of that spirit and light from the highest parts of the heavens, that is, from the stars of the firmament or perhaps from the seats of the most sublime. "And its path goes up to its highest point" refers to the reflection and, as it were, the re-emanation of that light up to that same summit of the world.[73] What follows, "Nor is there any thing which escapes its heat," refers to the

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[73] Original Italian: "Da quello che segue, *a summo caeli egressio eius*, aviamo la prima derivazione e partite di questo spirito e lume dall' altissime parti del cielo, ciò è sin dale stele del frimamento o anco dale sedi più sublimi. *Et occursus eius usque ad summum eius*: ecco la reflessione e, per così dire, la riemanazione dell' istesso lume sino alla medesima sommità del mondo" (*Le Opere di Galileo Galilei*, vol. 5, p. 304).

> vivifying and fecundating heat, which is distinct from the light, and which is much more penetrating through all material substances, even the most dense. For there are many things which fend off and recover from the penetration of light, but from this other power "there is nothing which escapes its heat."[74]

Galileo then goes on to talk about the sunspots he has discovered that seem to indicate that the whole mass rotates. From this he theorizes that all the other celestial bodies rotate, including and especially the Earth. Unbeknownst to Galileo, astronomical science has revealed that only some of the planets rotate, and thus Bellarmine was, by our modern hindsight, correct in disallowing Galileo to make such an unqualified presumption.

Galileo's interpretation of Psalm 19 is precisely what we would expect from someone who, although he might have a devotion to God and Scripture, takes advantage of some of the metaphorical language of the passage so that he can mold it to his preconceived interpretations of the scientific data. The letter to Dini shows quite clearly that Galileo believed Copernicanism was a fact of science.[75] Once he established that premise, it was a rather easy task to apply secondary or alternative meanings to Scripture's words. The same is done today by modern exegetes who have accepted heliocentrism as a scientific fact. Since science, unlike Scripture, usually does not sprinkle metaphors in its celestial descriptions, the public assumes that scientific propositions are precise and unfazed by pride or prejudice, but that Scripture, at least those portions that have a healthy mixture of poetry and prose, are to be molded to conform to one's scientific interpretations, which would then allow a modification to the non-metaphorical words of Scripture so that they, too, can conform. The basic question is, of course: when is Scripture to be interpreted literally and when is it to be interpreted figuratively? Arriving at the answer is sometimes a very difficult process. More contentions in religion, and even within the heart of Christianity, have been caused by whether Scripture is to be interpreted literally or figuratively than probably any other single cause, save man's own blindness caused by sin. Suffice it to say, there must be an ultimate authority on how Scripture is to be interpreted. There really is no other way to solve the problem. As it stands, Bellarmine represented that authority and Galileo himself recognized it. For all his scientific prowess, Galileo knew that the final word rested with the Church, which was guided by the Holy Spirit.

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[74] *Le Opere di Galileo Galilei*, vol. 5, pp. 303-304, as translated by Blackwell in *Galileo, Bellarmine and the Bible*, pp. 214-215.

[75] Galileo states that Copernicanism is "qual è il sapere la vera disposizione delle parti del mondo" ("the knowledge of the true arrangement of the parts of the world") (*Le Opere di Galileo Galile*i, vol. 5, p. 298).

Be that as it may, Galileo's interpretation is rather poor even on a basic exegetical level. For all his attempts at turning the metaphors into representations of the sun's light, Galileo ignores the fact that not once does the passage explicitly refer to the sun's light. Not even the last sentence ("and there is nothing hid from its heat") specifically mentions the sun's light. The addition of "heat" to the passage is more of an afterthought, hence, what emanates from the sun is not the primary focus of the passage. Galileo's attempt to picture light as a strong man running a course is also off the mark. By his own testimony ("for light emanates as though it were instantaneous") light proceeds effortlessly from the sun. There is no labor involved, which is quite opposite the picture we imagine of a runner in a strenuous race against the elements or his opponents.

Additionally, Galileo, perhaps not familiar with the Hebrew of the Old Testament, seems unaware that the word "circuit" (verse 6: "and its circuit to the end of them") refers to the space of one year as opposed to instantaneous emanation.[76] In other words, the Psalmist insists that it takes the sun one year to compete its circuit, whereas to Galileo, due to his interpretation of the Latin Vulgate's "occursus," believes he has room to posit that the sun completes its task instantaneously wherever it is in the universe.

Coupled with the above problem is the beginning of verse 6: "Its rising is from the end of the heavens,") where again Galileo is working off the Latin translation which renders it "a summo caeli egressio eius," and translates literally into English as "to the highest heaven progress his" or more easily "his progress is to the highest heavens."[77] Galileo, appealing to the connotation engendered by the word "progress," is led to think in a metaphysical-type framework, or possibly that the sun's light "progresses" from the stars above it. It is safe to say that neither Galileo nor few, if any, of his contemporaries would have known the actual grammar of the passage, which is somewhat deeper than what our English, or even the Latin, translations can afford us. Saving for the clause "and nothing is hid from its heat," the grammatical structure of Psalm 19:6 [18:7] places "from the end" and "to their ends" at opposite poles of the main clause, and positions "his rising" and "his circuit" as one unit connected by a *waw*-consecutive, which is then placed between the two "end" points noted above.[78] Because a circle has neither beginning nor end, the polarity of "from the end…to their ends" is the colloquial way to describe the dimensions of a circle. If it begins at the ending and ends at the ending, then it has no beginning or ending. It just continues, *ad infinitum*. Within this closed circle, the Psalmist puts both the "rising or going forth" of the sun grammatically adjacent to its "circuit or orbit," thus denoting that the "going forth" is the same as its circuit or orbit that transpires between the two end points, all of which takes place in one year. With the additional fact the passage does not mention the stars as an end point, Galileo's interpretation is high on imagination but rather low on solid evidence.

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[76] See previous footnote #233 on תקופה (*tequphah*).

[77] The Latin Vulgate, which for Psalm 19:6 is Psalm 18:7, has: "a summo caeli egressio eius, et occursus eius usque ad summum eius nec est qui se abscondat a calore eius," of which both clauses are somewhat inadequate in relaying the original Hebrew.

1Chronicles 16:30

> Tremble before him, all the earth; yea, the world stands firm, never to be moved.

Psalm 93:1-2

> [1]The Lord reigns; he is robed in majesty; the Lord is robed, he is girded with strength. Yea, the world is established; it shall never be moved.
> [2]Thy throne is established from of old; thou art from everlasting.

The point of these passages is to portray the Lord's majesty and strength, as a king who wears his royal robes signifies that he reigns supreme over all the land and has subdued all his enemies. One specific display of the Lord's power is that he has established the world so that it cannot move. Like the throne of a king that does not move unless by his order, so the world has been set and will not be moved.

Although the comparison between the strength of God and the stability of the world is quite evident in the passage, there are very few options available regarding the meaning of the "establishment of the world" if one seeks to make a legitimate comparison to God. The world cannot refer to the political machinations of the nations, for they shift quite frequently. It could not refer to the whole universe, since if the universe were moved, to where would it move? The best way the Psalmist's analogy can have its intended effect is if an object exists that is unmoved in the midst of all other objects that are moving. For example, if the Psalmist were referring to an unmoving Earth, then the image displayed by Ps 93:1 would be most accurate, for the Earth would be the only body at rest in the midst of a sea of moving bodies in the heavens. The Earth would be the only foundation point; the only immovable object, and thus the best example to picture of the immutability of God himself. More to the point is that Ps 93:2 adds that God's throne is also "established."[79] Logically, if his throne does not move then the world cannot move. The intended imagery would be identical to passages that call the Earth the "Lord's footstool," since footstools are understood to be at rest, not moving.[80]

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[78] The Hebrew word order is as follows: מקצה (from the end of) השמים (the heavens) מוצאו (his rising, or going forth) ותפוקתו (and his circuit or orbit) על (to) קצותם (their ends).

Some might object that the phrase "shall never be moved" could also be translated as "shall never be shaken." If that is the case, then one could argue that a "shaking of the world" could have some political overtones. This might be true, except for the fact that the political systems of the world are inherently unstable, and thus they would not make a good comparison in displaying the strength and throne of God almighty. Conversely, the physical world, marked as it is by times and seasons that have been repeating themselves in exact precision for eons, is the only possible "world" that could be compared to the infinite stability of God.

In actuality, if the proper translation were "shaken" rather than "moved," this would only enhance the imagery of an immobile Earth, for this interpretation would require that the Earth be so firm in its position that it would not only be prohibited from rotating or revolving, but it would also be prohibited from shaking. As we learned in the science portion of this work, the Earth is held in space by the combined torque of the whole universe. To move the Earth would require that it overcome the combined torque of the universe. Consequently, we can see why this particular Hebrew word (*mōht*) for "move" or "shaken" was chosen, since it includes the Earth's resistance to even the slightest outside movement.[81] If vibration occurs, it will occur within the internal structure of the Earth but not with respect to the Earth's position in space. In fact, the reason earthquakes occur is that the internal movements within the Earth are rubbing against the external forces that are keeping the Earth immobile in space.

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[79] Ps 93:1 and 93:2 use the same Hebrew word for "established," the word כּוּן (*kun*), which appears over a hundred times in the Old Testament in most of the Hebrew tenses. In vr. 1 it is utilized in the Niphal imperfect and in vr. 2 in the Niphal participle, which is the simplest of the passive tenses. Although *kun* includes the concept of an original founding date (*e.g.*, "the building was established in 1955"), it also includes the concept of stability and longevity (*e.g.*, "the rock of Gibraltar was established"). *Kun* also refers to rest or immobility (Jg 16:26: "and Samson said to the lad who held him by the hand, 'Let me feel the pillars on which the house rests'"; 16:29: "And Samson grasped the two middle pillars upon which the house rested"; Er 3:3: "They set the altar in its place").

[80] Is 66:1; Mt 5:35. In all of these passages the notion of "rest" for the Lord's footstool is emphasized: Is 66:1: "Heaven is my throne and the earth is my footstool; what is the house which you would build for me, and what is the place of *my rest*?"; 1Ch 28:2: "I had it in my heart to build a *house of rest* for the ark of the covenant of the Lord, and for the footstool of our God"; Ps 132:7-8: "Let us go to his dwelling place; let us worship at his footstool! Arise, O Lord, and go to thy *resting place*, thou and the ark of thy might" (see also Ac 7:49). "Rest," of course, refers to motionlessness, which is appropriate in the Earth's case only if it is not moving through space.

The only other detail of Ps 93:1-2 regards the meaning and usage of the word "world." As it stands, the Hebrew consistently uses the term in reference to the earth, not the universe at large.[82] Hence, it is the Earth alone that is kept immobile, not the universe.

Psalm 96:9-11

> [9]Worship the Lord in holy array; tremble before him, all the earth!
> [10]Say among the nations, "The Lord reigns! Yea, the world is established, it shall never be moved; he will judge the peoples with equity."

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[81] Hebrew: מוט (*mōht*) appears 39 times in the Old Testament, 20 in the Psalms. The Qal form appears 13 times, 23 times in the Niphal, and one each in the Hiphil and Hithpael. It can refer to things as simple as slipping with the foot (Dt 32:35; Ps 17:5; 38:16-17) to moving the earth (Ps 82:5; Is 24:19). *Mōht*, in the physical sense, refers to the transition from a state of rest to a state of movement; in the figurative sense, from a state of stability to a state of instability. Of all the words in Hebrew referring to movement (*e.g.*, חפץ, חרץ, נדד, נוע, פוק, רחף, *et al*) מוט (*mōht*) is used when any, even the slightest movement, is in view. Hence, it can refer to a shaking or vibration as well as a change of location.

[82] Hebrew: תבל (*tebel*) appears 38 times in the Old Testament. It is often a poetic synonym of ארץ (*erets*) referring to the "earth" (*e.g.*, 1Sm 2:8; Ps 33:8; 77:18; 90:2; Is 34:1; Lm 4:12), but in non-poetic contexts it sometimes has a larger focus than the physical world and may include the more abstract notions associated with existence, such as the totality of human consciousness (*e.g.*, Is 24:4; 26:9). In the non-poetic passages that *tebel* is used without *erets*, *tebel* always refers to the earth or that which is inhabited by mankind (*e.g.*, 2Sm 22:16; Is 13:11; 14:17, 21; 18:3), not to the universe at large.

> [11]Let the heavens be glad, and let the earth rejoice; let the sea roar, and all that fills it;

Here again the Hebrew כון *kun* and מוט *mōht* appear in tandem. Although it would be proper to interpret *kun* ("established") and *mōht* ("moved") as words conveying the idea that the Lord's reign over the nations is such that it will be uninterrupted and always produce justice, the unavoidable dimension of this passage is that the Lord's reign is being compared to the already known fact of the world's immovability, and it is the Hebrew poetic form that brings these two dimensions into comparison. Without the poetic form, the passage could have simply stated: "The Lord's reign is established and it shall never be moved, he will judge the people with equity," and the salient point of the Psalmist would have been accomplished nonetheless. But within the poetic form, the Psalmist is drawing on facts he and other authors have stated elsewhere about the world's establishment and immobility, such as Ps 104:5: "Thou didst set the Earth on its foundations, so that it should never be shaken" or 1Ch 16:30: "tremble before him, all the Earth; yea, the world stands firm, never to be moved." In other words, he is using the scientific fact of the Earth's motionlessness as the basis for the analogy as to why the Lord will always reign and judge with equanimity. Both states will always be true: (1) the Lord will reign with equity, and (2) the world will never move. One verifies and supports the other. If one fails, the other fails also.

We can imagine how difficult it would have been for the Psalmist to prove his point if, indeed, the world was constantly moving through space. If it were a fact that the Earth was moving, the Pslamist would, instead, have had to make a comparison between the stability of the Earth's orbit and the stability of the Lord's reign. In actuality, however, he cannot do so, because previously he had made a comparison between the stability of the Lord's reign and the orbit of the sun (*e.g.*, Ps 19:4-14), and thus it would not be permissible now to compare the Lord's reign to the orbit of the Earth, since obviously both the sun and the Earth cannot be orbiting around each other.[83]

On a theoretical basis, one might object that since the Psalmist regards the sun as orbiting the Earth he could just have easily regarded the Earth as orbiting the sun, since both systems are equivalent, geometrically speaking. But although the geometrical reciprocity between the two celestial models is true, the Psalmist is working from a perspective of propositional truth that will only allow him to appeal to the *actual* celestial model and force him to discount its geometric or mathematical equivalent. That is, since the Psalmist's major point concerns the eternal stability of God's reign, he can only communicate that important truth analogously if he knows which celestial model is actually true, the heliocentric or the geocentric. Any false information will necessarily negate his analogy.

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[83] Moreover, mutual orbiting around a common center of mass will also not satisfy the Psalmist since in that case neither the sun revolves around the Earth nor the Earth revolves around the sun.

To say it another way, although one could argue that from a relativistic perspective the Psalmist has the option of using the stability of an orbiting Earth as the analog to the Lord's stable reign, the fact remains that he, in the general scope of his Psalmic writings, chooses an immobile Earth (Ps 96:10) and a moving sun (Ps 104:4-6). This choice is significant, since in order to make valid the analogy he is proposing the Psalmist must base it on an incontrovertible scientific fact. If he chooses the wrong celestial model, his very purpose in creating the analogy is defeated, for the Lord's reign cannot be compared to something fictitious. Either the Earth is fixed and the sun moves around it, or the sun is fixed and the Earth moves around it. Both cannot be true, and the Psalmist must adopt the correct one in order for his analogy to be genuine.

In retrospect, we can see why the Psalmist does not state cosmological truths as mere brute facts. Rather, to make the strongest argument, he purposely compares the immobility of the Earth to the unshakable reign of the Lord, since in serving as witnesses to one another, both must be absolutely true, or, consequently, both are absolutely false. Similar to instances in which God swears to Himself because he can find no one greater to serve as a witness (*cf.* Hb 6:13-18), so here in the Psalms we have the Lord comparing his unflappable divine justice to a divinely-set immovable object.

Some might object, however, that passages such as Ps 82:5 ("They have neither knowledge nor understanding, they walk about in darkness; all the foundations of the earth are shaken") contradict the above conclusion that the Earth does not shake. A careful comparison, however, will show that Ps 82:5 specifies that the "foundations" of the Earth, not the Earth itself, are shaken, while Ps 96:10 says that the *world*, in its totality, will not be shaken or moved.[84] As noted earlier, the "foundations" of the Earth are part of the inner structure of the Earth which lie beneath its surface. The foundations may shake but they will not move the Earth itself out of the position in space God has given it.

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[84] The same emphasis on the "foundations" is noted in the following passages: Ps 18:7: "Then the earth reeled and rocked; the foundations also of the mountains trembled and quaked, because he was angry." Similar rationale can be applied to Ps 46:2; 60:2; 68:8; 97:4; 99:1; 104:32.

Psalm 75:2-4

> [2]At the set time which I appoint I will judge with equity.
> [3]When the earth totters, and all its inhabitants, it is I who keep steady its pillars. *Selah*
> [4]I say to the boastful, "Do not boast," and to the wicked, "Do not lift up your horn."

Here the "tottering" refers to the Earth's land mass, not the Earth's position in space. Although the land mass may totter, and perhaps even vibrate its pillars, ultimately God holds the pillars in position and the Earth's surface remains firm. The Hebrew word for "totters" is מוג (*moog*), which refers mostly to "melting" or some kind of structural weakening.[85] Similar to all the other Psalms that speak in this same way, the movement attributed to the Earth refers to its internal structure, not its spatial position in the cosmos.

Psalm 104:5, 19

> [5]Thou didst set the earth on its foundations, so that it should never be shaken.
> [19]Thou hast made the moon to mark the seasons; the sun knows its time for setting.

This Psalm makes an important distinction from the other Psalms that speak of the foundations of the Earth shaking, particularly Ps 82:5 ("They have neither knowledge nor understanding, they walk about in darkness; all the foundations of the earth are shaken"). Ps 104:5 is very similar to Ps 96:10: "Yea, the world is established, it shall never be moved," since both passages are speaking about the Earth's position in space. The word for "foundations" in Ps 104:5 is not the normal word used for "foundations of the Earth," but the Hebrew מכון (*mahchon*), which refers to a fixed place.[86]

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[85] Hebrew מוג (*moog*), appears 17 times in the Old Testament, mostly as "melt" (*e.g.*, Ex 15:15; Ps 46:6; Am 9:5), sometimes "faint" (*e.g.*, Js 2:9; Jr 49:23). Ps 75:3 is in the Niphal participle ("when the Earth and its inhabitants are melting…").

[86] Hebrew מכון (*mahchon*) appears 17 times in the Old Testament, and refers to a settled and immovable place. In 16 of the references it refers to God's dwelling place that is impenetrable and immovable (*e.g.*, Ex 15:17; 1Kg 8:13, 39, 43, 49; 2Ch 6:2, 30, 33, 39; Er 2:68; Ps 33:14; 89:14; 97:2; Is 4:5; 18:4). The only time God's "place" is moved is in the apostasy (Dn 8:11). The word מכון is applied to

As such, it is referring to the fact that the Earth is positioned in its spatial foundation (*e.g.*, Jb 26:7: "he…hangs the Earth upon nothing") from which it cannot be moved or shaken. Additionally, in contrast to the Earth's spatial immobility, the Psalmist speaks in vr. 19 of both the moon and the sun moving in space to accomplish their particular tasks.

Psalm 119:89-91

> [89]For ever, O Lord, thy word is firmly fixed in the heavens.
> [90]Thy faithfulness endures to all generations; thou hast established the earth, and it stands fast.
> [91]By thy appointment they stand this day; for all things are thy servants.

There are several interesting features to this passage. First, the phrase "stands fast" is from the Hebrew עמד (*amad*), the same word appearing in Joshua 10:12-13 in reference to the sun and moon that *temporarily* had no spatial movement in the sky. But here in Psalm 119 it is applied to the Earth that is *always* without movement. It does not refer merely to the existence of the Earth, since the preponderant usage of *amad* in Hebrew refers to the lack of motion or the deliberate cessation of motion.[87] *Amad* is also the word behind the phrase "they stand" in vr. 91, although it is in the plural since it is referring to both "all generations" and the "Earth." By the same token, the Psalmist is careful not to imply that the "heavens" themselves stand fast like the Earth; rather, the heavens are merely an indication of the general steadfastness of the Lord's word.[88] As was the case in Ps 96:9-11, the Psalmist is comparing the very character of God to the scientific fact of the Earth's motionlessness. One fact supports the other.

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the Earth once (Ps 104:5), which states that the Earth is set into its מכון, from which it cannot be shaken or moved. A similar word is מכונה, the feminine form of מכון, which appears 24 times and is normally translated as "stands" or "base" (1Kg 7:27-43).

[87] Hebrew עמד (*amad*) appears over 500 times in the Old Testament, usually denoting the conscious decision of the individual to cease motion and remain in a certain position (*e.g.*, Gn 19:27; 41:46; 2Ch 34:31).

[88] The RSV's "firmly fixed" in Ps 119:89 is the Hebrew נצב (*nahtzab*), a frequently used word in the Old Testament referring to something built or erected with firmness or authority.

Ecclesiastes 1:4-7

> [4]A generation goes, and a generation comes, but the earth remains for ever.
> [5]The sun rises and the sun goes down, and hastens to the place where it rises.
> [6]The wind blows to the south, and goes round to the north; round and round goes the wind, and on its circuits the wind returns.
> [7]All streams run to the sea, but the sea is not full; to the place where the streams flow, there they flow again.

In 1579, Didacus à Stunica, in his famous commentary on Job in which he opted for the Copernican system, stated the following about the above passage:

> "that text signifieth no more but this, that although the succession of ages, and generations of men on earth be various, yet the earth itself is still one and the same, and continueth without any sensible variation…and it hath no coherence with its context (as Philosophers show) if it be expounded to speak of the earth's immobility. The motion that belongs to the earth by way of speech is assigned to the sun even by Copernicus himself, and those who are his followers….To conclude, no place can be produced out of Holy Scriptures which so clearly speaks the earth's immobility as this doth its mobility. Therefore this text of which we have spoken is easily reconciled to this opinion. And to set forth the wonderful power and wisdom of God who can indue the frame of the whole earth (it being of monstrous weight by nature) with motion, this our Divine pen-man added: 'And the pillars thereof tremble.' As if he would teach us, from the doctrine laid down, that it is moved from its foundations.[89]

Stunica, whose book was eventually condemned in 1616 along with Galileo's works, sees no problem interpreting the passage the exact opposite of what the face value wording exhibits. He attempts to reverse the role of the sun's movement against the Earth's immobility by appealing to what a tremendous feat it would be, and a point he feels that

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[89] Quoted in Thomas Salusbury's *Mathematical Collections and Translations*, London, 1616, pp. 468-470, as cited in Stimson's *The Gradual Acceptance of the Copernican Theory of the Universe*, pp. 44-45.

Solomon himself wishes to stress, for God to move such a heavy object as the Earth around the sun. Hence, according to Stunica, if we should glean any truth about the physical universe from this verse it should be that putting the Earth in motion is a testimony to the great power of God, and therefore Copernicanism is vindicated as more worthy than models advocating a non-moving Earth. Apparently, it didn't occur to Stunica that it would have been an even more tremendous feat for God to move the sun around the Earth, since now we know that it is a million times bigger than the Earth and weighs 333,000 times as much.

Irrespective of Stunica's poor attempt, there are several important features to the passage. First, by making reference to what we now know are scientific facts (*e.g.,* the circuits of the wind and the courses of rivers running into the sea), the context establishes itself as teaching general facts about terrestrial events. That being the case, one can logically assume that the passage is also giving scientific information about the celestial events it addresses, namely, the movement of the sun between the horizons. Although one might object that the language of the 'sun rising' and 'sun going down' is phenomenal, this does not prove that the sun does not revolve around the Earth in the scientific sense. If the author of the passage is working from knowledge of the scientific fact of the sun's movement, he could describe a revolving sun either from the phenomenal perspective (*e.g.,* sun rising or setting) or from the actual perspective (*e.g.,* the sun revolves around the Earth). Considering that the author knows the scientific facts about the courses of the Earth's winds and rivers, he would most likely know the scientific facts concerning the other objects that traverse the Earth's domain, in this case, the sun. Not only does the author appear familiar with the science of the sun's course, he also knows enough to describe the movement as one requiring much labor.[90] This was the very reason that Cardinal Bellarmine appealed to the "wisdom of Solomon" to defend geocentrism when he confronted Galileo, which we will see in more detail in Chapter 17.

Second, similar to other passages that speak of the Earth's stability, Solomon says that the Earth "remains forever." By itself, we may grant that the clause may be making a mere indicative statement that the Earth exists and remains unchanged while a new population of human beings appears every generation. In the context of a moving sun, however, the implication of the clause tends more toward affirming the truth stated in other passages, namely, that the Earth is motionless in space. The Hebrew word for "remains" is עמד (*amad*), which is the same word employed both by the Psalmist to depict the Earth's motionlessness and by Joshua to describe the cessation of both the sun's and moon's movement (Js 10:13). Moreover, while the sun and moon of Joshua's day ceased their movement temporarily, Solomon tells us that the Earth maintains its celestial *amad*, "forever," from the Hebrew word עולם (*olam*), which can refer to an unending time or a long but indefinite period. In the case of the Earth's state of motionlessness, *olam* is the appropriate word to use since the Earth will remain as it is at least until the end of time, and perhaps continue as such in the New Heaven and New Earth.[91]

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[90] The author uses the Hebrew word שׁאף (*shaaph*) which refers to the panting or gasping that comes from hard labor. As we noted in the scientific portion of this book, the sun travels in the opposite direction to the rotation of the universe, lagging behind by about one degree per day due to the sheer force of the universe's current, which then makes the sun appear to travel through the zodiac once per year.

Ecclesiasticus (Sirach) 43:1-10

> [1]The pride of the heavenly heights is the clear firmament, the appearance of heaven in a spectacle of glory.
> [2]The sun, when it appears, making proclamation as it goes forth, is a marvelous instrument, the work of the Most High.
> [3]At noon it parches the land; and who can withstand its burning heat?
> [4]A man tending a furnace works in burning heat, but the sun burns the mountains three times as much; it breathes out fiery vapors, and with bright beams it blinds the eyes.
> [5]Great is the Lord who made it; and at his command it hastens on its course.
> [6]He made the moon also, to serve in its season to mark the times and to be an everlasting sign.
> [7]From the moon comes the sign for feast days, a light that wanes when it has reached the full.
> [8]The month is named for the moon, increasing marvelously in its phases, an instrument of the hosts on high shining forth in the firmament of heaven.
> [9]The glory of the stars is the beauty of heaven, a gleaming array in the heights of the Lord.
> [10]At the command of the Holy One they stand as ordered, they never relax in their watches.

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[91] *Cf.* Is 65:17; 66:22; 2Pt 3:10-13; Ap 21:1.

This passage provides confirmation of the sun's circular course around the Earth. Ecclesiasticus (or Sirach) was written late in Israel's history (circa 180 B.C.). About two-thirds of the original Hebrew of the book has been recovered, the other one-third is dependent on the surviving Greek translation. The time period of its writing is significant for the simple reason that the Greek philosophers during this period were debating amongst themselves whether the Earth was fixed with the sun revolving around it or vice-versa: *e.g.*, the Pythagorean school of heliocentrists: Plato, Philolaus, Pliny, Aristarchus, and Seleucus versus the geocentric school of Aristotle, Hipparchus, Theon of Smyrna, Appolonius.[92] The Hebrews maintained their belief in the geocentric cosmos so as to remain in the tradition received from their inspired writings. Identical to the writers which came a millennia or so before him, Sirach makes a seamless presentation of scientific facts, treating the sun as a body which moves with tremendous speed at the same time that he describes it as a marvelous heat-producing machine, both he considers as scientific facts. At no time does any biblical writer treat the sun's movement as unscientific or illusionary or treat its heat as the only firm scientific fact about its nature or task.

Job 9:6-10

> [6]who shakes the earth out of its place, and its pillars tremble;
> [7]who commands the sun, and it does not rise; who seals up the stars;
> [8]who alone stretched out the heavens, and trampled the waves of the sea;
> [9]who made the Bear and Orion, the Pleiades and the chambers of the south;
> [10]who does great things beyond understanding, and marvelous things without number.

The shaking of the Earth here refers to the land mass of the Earth, since the Hebrew word for "Earth" is ארץ (*erets*) which can refer to "land" or "Earth." In other words, Job is describing an earthquake. This is confirmed by the fact that it is the "pillars" of the Earth that are specifically stated as "trembling." But if one were to insist that *erets* refers to the whole Earth, this would only strengthen the geocentric argument, since in order for the whole Earth to be shaken out of its place it must have had a place in which it was previously at rest. If the Earth were in orbit and the orbit were disturbed, the appropriate language would be "shaken out of its path" or "shaken out of its course" not "out of its place."

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[92] Other Greeks include: Anaximander, who held to a central Earth surrounded by spherical heavens; Parmenides held to a central Earth with evenly spaced concentric spheres surrounding it; Xenophanes held to a central Earth and stars that moved rectilinearly; Empedocles also held to a central Earth but an infinite universe; whereas Hiketas Heraklides and Ekphantus held that the Earth rotates in a non-moving heavens.

The other geocentric dimensions to the passage are the fact that the sun is viewed as a moving object ("who commands the sun, and it does not rise") and that the constellations ("the Bear and Orion, the Pleiades") produce their respective forms only when viewed from Earth, whereas outside of Earth the forms do not exist.

Job 22:13-14

> [13]Therefore you say, "What does God know? Can he judge through the deep darkness?
> [14]Thick clouds enwrap him, so that he does not see, and he walks on the vault of heaven."

This passage is important because it speaks of "the vault of heaven." The word "vault" is the Hebrew noun חוּג (*chog*), which appears only three times in the Old Testament. The other two references are Pr 8:27 ("circle on the face of the deep") and Is 40:22 ("circle of the Earth"), both of which refer to a "circle" or "circuit." The verbal form appears once in the Qal perfect in Jb 26:10 as "described a circle" (see Jb 26:10 below). The important point to be gleaned from these passages is that the heavens are said to have a circle in which God moves (Jb 22:14) but the Earth has a circle over which God sits (Is 40:22). In the former God is moving, while in the latter he is stationary. Since the Earth does not move, God can remain at rest above it.

Job 26:7-9

> [7]He stretches out the north over the void, and hangs the earth upon nothing.
> [8]He binds up the waters in his thick clouds, and the cloud is not rent under them.
> [9]He covers the face of the moon, and spreads over it his cloud.

The above verses are part of the answer that Job gives to Bildad the Shuhite who has accused Job of being unjust and therefore deserving of the calamities that God has allowed to come upon him. Bildad's ending words in Jb 25:4-6 are quite stinging:

> [4]How then can man be righteous before God? How can he who is born of woman be clean? [5]Behold, even the moon is not bright and the stars are not clean in his sight; [6]how much less man, who is a maggot, and the son of man, who is a worm!

In his opening response, Job affirms God's greatness by remarking on his creative actions. Similar to the Psalms, Job speaks of environmental phenomena in a scientific sense, yet in simple language (*e.g.*, vr. 8: water accumulates in clouds and yet the cloud does not tear itself apart or drop from the sky because of its weight). The unique dimension that Scripture gives to these events is that God is behind them all and thus they are not mere brute forces of nature. Where the dividing line between God's action and natural events actually exists is not discussed, however. It is just assumed by both the writer and reader that ultimately God is the cause of all we see in nature.

Verse 7 begins the listing of God's astounding feats by stating that he "stretched out the north over the void." The verb "stretched" is a Qal participle (נטה) referring to a past action that was in progress at one time, namely the beginning days of creation in Gn 1:1-2. The word "north" is the normal Hebrew word but there is no article, thus it can serve both as the north direction and as a synecdoche for the heavens.[93] It is the heavens or firmament that Scripture refers to as being "stretched out."[94]

The Earth is understood as separate from the north or heavens. While they are stretched out, the Earth is held motionless. Moreover, the Earth is not said to hang in the heavens, rather, it hangs on "nothing." In fact, Scripture never says that the Earth is in the heavens or is part of the heavens. It is suspended in a neutral position that is not part of the cosmos. This unique position is also immovable, since the word "hangs" denotes that once the Earth is placed in its special position it remains there by

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[93] The Hebrew sentence is as follows: נטה (he stretched) צפון (north) על־תהו (over the void). The coupling of "north" and the heavens is also noted in Is 14:13: "I will ascend to heaven…in the recesses of the north."

[94] Jb 9:8: "who alone stretched out the heavens"; Ps 104:2: "he stretched out the heavens like a tent"; Is 42:5: "who created the heavens and stretched them out"; Is 45:12: "it was my hands that stretched out the heavens" (see also Is 40:22; 51:13; Jr 10:12; 51:15; Zc 12:1).

God's constant power.[95] Scientifically speaking, we noted earlier that if the Earth is the center of mass for the entire universe, all forces are neutral at the center; and whatever is placed in the center is immovable. As Newton himself put it: "That the center of the system of the world is immovable….This is acknowledged by all, although some contend that the Earth, others that the sun, is fixed in that center."[96] Moreover, if there is no single force holding the Earth in its position then the Earth cannot be revolving around the sun, for in that case the sun's gravity would determine the position of the Earth.

Job 26:10-11

> [10]He has described a circle upon the face of the waters at the boundary between light and darkness.
> [11]The pillars of heaven tremble, and are astounded at his rebuke.

Proverbs 8:27-30

> [27]When he established the heavens, I was there, when he drew a circle on the face of the deep,
> [28]when he made firm the skies above, when he established the fountains of the deep,
> [29]when he assigned to the sea its limit, so that the waters might not transgress his command, when he marked out the foundations of the earth,
> [30]then I was beside him, like a master workman; and I was daily his delight, rejoicing before him always.

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[95] "hangs": Hebrew: תלה, Qal participle representing a continuing action. It would seem from the grammatical form chosen for Jb 26:7 that God continually works to keep the Earth in its immobile position. "Nothing" is the common Hebrew word בלי, (*beli*) meaning "without," combined in construct form with the indefinite pronoun מה (*mah*), meaning "anything" or "aught."

[96] Isaac Newton, *Philosophiae Naturalis Principia Mathematica*, Book 3, "The System of the World," Proposition X. In Proposition XI Newton adds: "That the common center of gravity of the Earth, the sun, and all the planets, is immovable. For that center either is at rest or moves uniformly forwards in a right line; but if that center moved, the center of the world would move also, against the Hypothesis."

As is the case with most of the wisdom literature of the Old Testament, the writers have a knack for putting scientific truths in poetical form with just the right amount of rhythmical cadence. To express such profound truths with such an economy of words that never lose their aesthetic or alliterative appeal is truly the mark of good writing. Moreover, the common man can easily confirm these truths since, for example, he is quite aware that the sea stops at the shore line; that the tides go in and out like clockwork; and that the water/land boundary is so precisely marked that all life on Earth is sustained by its delicate balance.

The truth that is expressed both in Jb 26:10: ("a circle upon the face of the waters between the boundary of light and darkness") and Pr 8:27: ("he drew a circle on the face of the deep") is spoken from a geocentric perspective. The "circle" would correspond to either the equatorial line separating the hemispheres of the Earth (and its corresponding lines of latitude), or the meridian line separating east from west (and its corresponding lines of longitude). When one half of the Earth is light, the other half is dark. In this sense, the Earth can be viewed as a spherical grid that can extend itself outward to point to every sector of the universe, and it could only do so if it was in the exact center of the universe and at the immobile fixed point upon which all coordinates are based.

Wisdom 7:15-22

> [15]May God grant that I speak with judgment and have thought worthy of what I have received, for he is the guide even of wisdom and the corrector of the wise.
> [16]For both we and our words are in his hand, as are all understanding and skill in crafts.
> [17]For it is he who gave me unerring knowledge of what exists, to know the structure of the world and the activity of the elements;
> [18]the beginning and end and middle of times, the alternations of the solstices and the changes of the seasons,
> [19]the cycles of the year and the constellations of the stars,
> [20]the natures of animals and the tempers of wild beasts, the powers of spirits and the reasonings of men, the varieties of plants and the virtues of roots;
> [21]I learned both what is secret and what is manifest,
> [22]for wisdom, the fashioner of all things, taught me.

The author states that God has given him knowledge of the inner workings of the cosmos. But it is not just mere knowledge, it is "unerring knowledge."[97] Part of the unerring information he knows is the "structure of the world," which we might assume contains the data of whether or not the Earth is the center of the universe's structure. If the "knowledge" contained information that the Earth was in the center and was immobile yet this was not a scientific fact, then it could not be considered "unerring." Knowledge that contains no error must be factual and cannot be excused by appeals to phenomenology. If the details of the cosmos that he knows unerringly include such things as "the activity of the elements," "the alterations of the solstices," "the changes of the seasons," and the "constellations of the stars," surely it must contain the data of whether these seasons and solstices are caused by the universe rotating around the Earth or the Earth rotating and revolving within the universe. As it stands, the writer of Wisdom who claims to have "unerring knowledge" gives us no evidence of a moving Earth; but consistently refers to the heavenly bodies as those that move, *e.g.*, Ws 13:2: "the circle [or circuit] of the stars."

1 Esdras 4:34 (apocryphal)

> [34]The earth is vast, and heaven is high, and the sun is swift in its course, for it makes the circuit of the heavens and returns to its place in one day.

Here the sun's daily movement in a 360 degree circuit is given in stark detail. It is treated as a scientific fact. It is buttressed by two other scientific facts, namely, the Earth's vastness and the height of the heavens above the Earth (*cf.* Jr 31:37; Jb 38:33).

Passages Purported to Support Heliocentrism

Job 38:12-14

> [12]"Have you commanded the morning since your days began, and caused the dawn to know its place,
> [13]that it might take hold of the skirts of the earth, and the wicked be shaken out of it?
> [14] It is changed like clay under the seal, and it is dyed like a garment.

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[97] Greek: γῶσιν ἀψευδῆ, literally, "knowledge without falsity."

Far from supporting a moving Earth, this passages actually strengthens the argument against it. Prior to God's "shaking" or "changing" of the Earth, the writer assumes that the Earth's normal state is one without any disturbing motions. Even in the highly metaphorical language employed by this writer, he specifies that it is only when the wicked reach a point of divine judgment that God even considers setting aside the Earth's normal state and separating the wicked from the Earth by shaking it. There is certainly nothing in this passage which suggests that the normal state for the Earth is one of movement (*e.g.*, rotation and revolution). Even the words used in the metaphor do not necessarily denote a disturbing movement, since the word "changed" is from the Hebrew word that preponderantly refers to an internal change rather than a change of position in space.[98]

Psalm 82:5

> They have neither knowledge nor understanding, they walk about in darkness; all the foundations of the earth are shaken.

Psalm 99:1

> The Lord reigns; let the peoples tremble! He sits enthroned upon the cherubim; let the earth quake!

As we noted previously in the analysis of Ps 96:10 above, these two Psalms are speaking about the disruptions that occur inside the Earth intermittently, not the cessation of an assumed rotation on an axis or revolution around the sun.

Isaiah 13:13

> Therefore I will make the heavens tremble, and the earth will be shaken out of its place, at the wrath of the Lord of hosts in the day of his fierce anger.

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[98] "changed": Hebrew: תתהפּך, to turn or transform. The root word הפּך appears over 75 times in the Old Testament, mostly in the Qal tense signifying an "overthrowing" or changing of form (*e.g.*, Lv 13:3; Dt 29:23). Only in the Hithpael participle does it refer to an actual movement, which occurs 3 times (Gn 3:24; Jg 7:13; Jb 37:12).

Isaiah 24:19-23

> [19] The earth is utterly broken, the earth is rent asunder, the earth is violently shaken.
> [20] The earth staggers like a drunken man, it sways like a hut; its transgression lies heavy upon it, and it falls, and will not rise again.
> [21] On that day the Lord will punish the host of heaven, in heaven, and the kings of the earth, on the earth.
> [22] They will be gathered together as prisoners in a pit; they will be shut up in a prison, and after many days they will be punished.
> [23] The moon will be confounded and the sun ashamed; for the Lord of hosts will reign on Mount Zion and in Jerusalem and before his elders he will manifest his glory.

Once again, identical to Jb 38:14, the two Isaiah passages assume that the normal state for the Earth is one of non-motion and non-vibration, the precise scientific requirements for geocentrism. It is only an extraordinary event that could alter that state of rest. In this case, the language is obviously apocalyptic and thus points to one specific day in which the cosmos will be disrupted from its normal course.

Job 37:18
The Constitution of the Firmament

Can you, like him, spread out the skies, hard as a molten mirror?

During the seventeenth-century investigations of the Congregation of the Holy Office into the Copernican theory, a Carmelite friar by the name of Fr. Paolo Foscarini was censured in 1615 (prior to the Galileo case) for his heliocentric cosmology. Little known is the fact that he was also censured for his belief that the heavens were "very thin and tenuous." Among other things, the censor stated:

> On page 45 he says that the heavens are very thin and tenuous, not solid and dense. This is clearly contrary to Job 37* 'Together with this you have created the heavens which are most solid and spread out like the air.' This cannot be explained as an

> appearance (as the author indicates) because the solidity of the heavens is not apparent to us.[99]

Obviously, the Catholic censor was treating Job 37:18 the same way the Catholic Church was treating the geocentric verses – they were taken at face value and considered factual truth, regardless of what subject matter they addressed. Here we see that even the particulate constitution of the space constituting all of the heavens is not considered a trivial and obscure point that can be ignored. It is regarded with the utmost divine authority and the basis for rejecting Foscarini's whole approach to Scripture. The battle ground here, as we will see in Chapter 17, is: can Scripture be trusted to give us factual information about the cosmos in addition to its already accepted infallible authority on faith and morals? The answer of the Catholic Church of the 17th century was an unequivocal and unqualified 'affirmative,' as it was for the sixteen centuries prior.

Accordingly, Job 37:18 has some very interesting features that support the censor's contention against Foscarini. The Hebrew sentence reads as follows: תרקיע ("can you beat out or spread out") עמֹו ("with him") לשׁהקים ("the sky, the heavens") חזקים ("hard") כראי ("like a mirror") מֹיצק ("cast"). The first word, תרקיע, is a verb appearing twelve times in the Hebrew bible and normally means "to spread or stretch out."[100] It is very similar to the noun רקיע, which is translated as "firmament" in Genesis and the Psalms.[101]

The word לשׁהקים ("the sky, the heavens") is from the root שׁהק and appears twenty-one times as either "sky";[102] "clouds"[103] "heavens,"[104] or even "dust,"[105] with a notable difference between "sky" and "clouds."[106] All in all, it carries the idea of a finely-grained substance that fills the sky, and by extension, the rest of the space of the firmament.

The word חזקים ("hard") appears over forty times and is translated as "strong" (Ex 13:9); "mighty" (Ex 32:11); "hard" (Ez 3:9). The word מֹיצק

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[99] The censor's document is titled: *Judicium de spistola F. Pauli Foscarini de mobilitate terrae* (Lerner in *The Church and Galileo*, p. 24). The text is from Blackwell in *Galileo, Bellarmine and the Bible*, pp. 253-254. We have changed "Tobit 37" to Job 37 since Blackwell apparently misread the original Latin.

[100] Ex 39:3; Nm 16:39; 17:4; 2Sm 22:43; Jb 37:18; Ps 136:6; Is 40:19; 42:5; 44:24; Jr 10:9; Ez 6:11; 25:6.

[101] Gn 1:6-8, 14-17, 20; Ps 19:1.

[102] Dt 33:26; 2Sm 22:12; Jb 37:18; Ps 18:11; 77:17; 108:4; Is 45:8; Jr 51:9.

[103] Jb 35:5; 36:28; 37:21; 38:37; Ps 36:5; 57:10; 78:23; Pr 3:20; 8:28.

[104] Ps 68:34; 89:6, 37.

[105] Is 40:15.

[106] 2Sm 22:12; Ps 18:11.

("cast") is from the root יצק and is translated variously as "cast" (Ex 25:12); "pour" (Lv 2:1); "forms" (Jb 38:38); "firm" (Jb 41:23-24); "attached to" (Ps 41:8); "molten" (1Kg 7:16). The literal meaning is that the sky, heavens or firmament, is not a tenuous, vaporous entity. Although ostensibly it is transparent and pliable, on another level (implied is the subatomic level), Jb 37:18 indicates the heavens are composed of an extremely dense material substance. At the beginning of creation it was expanded to fill the firmament, or perhaps became the firmament once it was expanded. As we noted in Volume I of *Galileo Was Wrong: The Church Was Right*, modern science has corroborated these biblical truths with a plethora of scientific data showing that space is not a vacuum but is filled with an extremely fine but extremely dense particulate matter.

The firmament, רקיע, constitutes the entire space between the Earth's surface and the edge of the universe, and into which the stars and other heavenly bodies are placed. This is in distinction to other Hebrew words, such as רוח (*reyach*), which refer to "space" (*e.g.*, Gn 32:17, not to be confused with רוח (*ruach* = spirit, *e.g.*, Gn 1:2; Ex 13:10)) or רחוק (*rachoq*), which refers to spatial distance,[107] words that the Hebrew writer did not choose to describe the substance of the heavens. Accordingly, many biblical translators have utilized the English word "firmament" (or its foreign equivalent) for the Hebrew רקיע in order to denote a firm but pervasive substance to represent the constitution of the heavens.[108] In other passage *raqia* appears as "hammered";[109] while in others it is "stamped";[110] as compared to "beaten" or "crushed" in 2Sm 22:43.

Essentially, Scripture tells us that the heavens are both flexible and rigid. Apparently, Foscarini's censor, by nothing more than a simple declaration from Holy Writ, accepted the dual nature of the firmament, one nature observable and the other unobservable, with the latter nature being one in which "the solidity of the heavens is not apparent to us." Conversely, a solid-shell model of the firmament, which is popular among more traditional Protestant biblicists, ignores these atmospheric and celestial dimensions, and consequently, does not do proper justice to the Scriptural language.[111]

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[107] Joshua 3:4; Ps 22:2.

[108] Gn 1:14, 15, 17, 20; Ps 19:2; 150:1; Ez 1:22-26; 10:1; Dn 12:3.

[109] Ex 39:3; Nm 17:3; Jr 10:9.

[110] Ez 6:11; 25:6.

[111] See "Is the raqiya' (firmament) a solid dome?" at answersingenesis.org/docs/4169.asp, James Holding versus Paul Seely, first published in *Technical Journal* 13(2):44-51, 1999.

Furthermore, in order to curb impudent clever persons, the synod decrees that no one who relies on his own judgment in matters of faith and morals, which pertain to the building up of Christian doctrine, and that no one who distorts the Sacred Scripture according to his own opinions, shall dare to interpret the said Sacred Scripture contrary to that sense which is held by Holy Mother Church, whose duty it is to judge regarding the true sense and interpretation of Holy Scriptures, or even contrary to the unanimous consent of the Fathers, even though interpretations of this kind were never intended to be brought to light.[112]

The Council of Trent, Fourth Session, 1563

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[112] *The Sources of Catholic Dogma*, translated by Roy J. Deferrari, from the 13th edition of Henry Denzinger's *Enchiridion Symbolorum*, Loreto Publications, 1954, p. 245, ¶ 786.

The Apostolic and ecclesiastical traditions and all other observances and constitutions of that same Church I most firmly admit and embrace. I likewise accept Holy Scripture according to that sense which our Holy Mother Church had held and does hold, whose it is to judge of the true meaning and interpretation of the Sacred Scriptures; I shall never accept nor interpret it otherwise than in accordance with the unanimous consent of the Fathers.

The Profession of Faith of the Council of Trent[113]

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[113] *Ibid*., p. 303, ¶ 995. Giovanni Riccioli, S. J., notes that it was the daily routine of Jesuit colleges to open the school year with a recitation of the above oath on the Bible (*Almagestum novum*, Bononiae, Typis Haeredis Victorii Benatii, 1651, Part II, p. 479, as cited in *Galileo, Bellarmine and the Bible*, p. 14). Riccioli was the author of *Almagestum Novum* in 1651, the 2500-page tome that stands as the most detailed and comprehensive defense of the magisterium's condemnation of Galileo.

Chapter 15

The Consensus of Church Fathers and Medieval Theologians on Geocentrism

On April 12, 1615, Robert Cardinal Bellarmine wrote a personal letter to Fr. Paolo Antonio Foscarini, who had been advocating the heliocentric view for some time. In the letter Bellarmine states:

> Second, I say that, as you know, the Council prohibits interpreting Scripture against the common consensus of the Holy Fathers; and if Your Reverence wants to read not only the Holy Fathers, but also the modern commentaries on Genesis, the Psalms, Ecclesiastes, and Joshua, you will find all agreeing in the literal interpretation that the sun is in heaven and turns around the earth with great speed, and that the earth is very far from heaven and sits motionless at the center of the world. Consider now, with your sense of prudence, whether the Church can tolerate giving Scripture a meaning contrary to the Holy Fathers and to all the Greek and Latin commentators.

Cardinal Bellarmine was referring to the ecumenical **Council of Trent** which stated the following decree regarding the authority of the consensus of the Fathers of the Church on the interpretation of Scripture:

> Furthermore, in order to restrain petulant spirits, It decrees, that no one, relying on his own skill, shall, in matters of faith, and of morals pertaining to the edification of Christian doctrine, wresting the sacred Scripture to his own senses, presume to interpret the said sacred Scripture contrary to that sense which holy mother Church, whose it is to judge of the true sense and interpretation of the holy Scriptures, hath held and doth hold; or even contrary to the unanimous consent of the Fathers; even though such interpretations were never intended to be at any time published. Contraveners shall be made known by their

> Ordinaries, and be punished with the penalties by law established.[114]

The teaching of the supreme authority of the consensus of the Fathers of the Church was reiterated in the same infallible form by **Vatican Council I** in 1870:

> But, since the rules which the holy Synod of Trent salutarily decreed concerning the interpretation of Divine Scripture in order to restrain impetuous minds, are wrongly explained by certain men, We, renewing the same decree, declare this to be its intention: that, in matters of faith and morals pertaining to the instruction of Christian Doctrine, that must be considered as the true sense of Sacred Scripture which Holy Mother Church has held and holds, whose office it is to judge concerning the true understanding and interpretation of the Sacred Scriptures; and, for that reason, no one is permitted to interpret Sacred Scripture itself contrary to this sense, or even contrary to the unanimous agreement of the Fathers.[115]

Pope Leo XIII confirmed the words of Cardinal Bellarmine and the Councils in his encyclical ***Providentissimus Deus***:

> …and, most of all, that they may understand that God has delivered the Holy Scriptures to the Church, and that in reading and making use of His Word, they must follow the Church as their guide and their teacher. St. Irenaeus long since laid down, that where the *charismata* of God were, there the truth was to be learnt, and that Holy Scripture was safely interpreted by those who had the Apostolic succession. His teaching, and that of other Holy Fathers, is taken up by the Council of the Vatican, which, in renewing the decree of Trent declares its "mind" to be this – that "in things of faith and morals, belonging to the building up of Christian doctrine, that is to be considered the true sense of Holy Scripture which has been held and is held by our Holy Mother the Church, whose place it is to judge of the true sense and interpretation of the Scriptures; and therefore that it is permitted to no one to interpret Holy Scripture against such sense or also against the unanimous agreement of the Fathers."

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[114] Council of Trent, Session IV.

[115] Vatican Council I, Chapter II, Denz. 1788.

> By this most wise decree the Church by no means prevents or restrains the pursuit of Biblical science, but rather protects it from error, and largely assists its real progress.
>
> The Professor of Holy Scripture, therefore, amongst other recommendations, must be well acquainted with the whole circle of Theology and deeply read in the commentaries of the Holy Fathers and Doctors, and other interpreters of mark. This is inculcated by St. Jerome, and still more frequently by St. Augustine, who thus justly complains: "If there is no branch of teaching, however humble and easy to learn, which does not require a master, what can be a greater sign of rashness and pride than to refuse to study the Books of the divine mysteries by the help of those who have interpreted them?" The other Fathers have said the same, and have confirmed it by their example, for they "endeavored to acquire the understanding of the Holy Scriptures not by their own lights and ideas, but from the writings and authority of the ancients, who in their turn, as we know, received the rule of interpretation in direct line from the Apostles." The Holy Fathers "to whom, after the Apostles, the Church owes its growth – who have planted, watered, built, governed, and cherished it," the Holy Fathers, We say, are of supreme authority, whenever they all interpret in one and the same manner any text of the Bible, as pertaining to the doctrine of faith or morals; for their unanimity clearly evinces that such interpretation has come down from the Apostles as a matter of Catholic faith. The opinion of the Fathers is also of very great weight when they treat of these matters in their capacity of doctors, unofficially; not only because they excel in their knowledge of revealed doctrine and in their acquaintance with many things which are useful in understanding the apostolic Books, but because they are men of eminent sanctity and of ardent zeal for the truth, on whom God has bestowed a more ample measure of His light. Wherefore the expositor should make it his duty to follow their footsteps with all reverence, and to use their labors with intelligent appreciation.

In 1965, **Vatican Council II** reiterated the Church's teaching on the authority of the Fathers:

> This tradition which comes from the Apostles develop in the Church with the help of the Holy Spirit. For there is a growth in

the understanding of the realities and the words which have been handed down. This happens through the contemplation and study made by believers, who treasure these things in their hearts (Lk 2:19,51) through a penetrating understanding of the spiritual realities which they experience, and through the preaching of those who have received through episcopal succession the sure gift of truth. For as the centuries succeed one another, the Church constantly moves forward toward the fullness of divine truth until the words of God reach their complete fulfillment in her.

The words of the holy fathers witness to the presence of this living tradition, whose wealth is poured into the practice and life of the believing and praying Church.[116]

The bride of the incarnate Word, the Church taught by the Holy Spirit, is concerned to move ahead toward a deeper understanding of the Sacred Scriptures so that she may increasingly feed her sons with the divine words. Therefore, she also encourages the study of the holy Fathers of both East and West and of sacred liturgies.[117]

…faithful to the truth which we have received from the apostles and Fathers of the Church, in harmony with the faith which the Catholic Church has always professed.[118]

Following the study of Sacred Scripture, the Holy Fathers, the doctors and liturgy of the Church, and under the guidance of the Church's magisterium…[119]

The knowledge of the sacred minister ought to be sacred because it is drawn from the sacred source and directed to a sacred goal. Especially is it drawn from reading and meditating on the Sacred Scriptures, and it is equally nourished by the study of the Holy Fathers and other Doctors and monuments or tradition.[120]

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[116] *Dei Verbum*, Ch. 2, 8.

[117] *Dei Verbum*, Ch. 6, 23.

[118] *Unitatis Redintegratio*, Ch. 3, II, 24.

[119] *Lumen Gentium*, Ch. 8, IV, 67.

[120] *Presbyterorum Ordinis*, Ch. 3, 3, 19.

…the words and deeds which God has revealed, and which have been set down in Sacred Scripture and explained by the Fathers and by the magisterium.[121]

The Fathers of the Church proclaim without hesitation…[122]

This doctrine is contained in the word of God and it was constantly proclaimed by the Fathers of the Church.[123]

Salient Points of the Church Fathers' Consensus:

- The Fathers never say the Earth moves.
- The Fathers always say the Earth is at rest at the center of the universe.
- The Fathers never say the sun is the center of the universe.
- The Fathers never say the sun does not move around the Earth, even in their scientific analysis of the cosmos.
- The Fathers always say the Earth is the center of the universe.
- The Fathers always say the sun moves in the same way as the moon moves.
- The Fathers recognize that some of the Greeks held that the Earth revolves and rotates, but they do not accept either of those teachings.
- The Fathers accept the Chaldean, Egyptian and Greek teaching that the Earth is at the center of the universe and does not move.
- The Fathers hold that the Earth was created first, by itself, and only afterward the sun, moon and stars. The only deviation from

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[121] *Ad Gentes*, Ch. 3, 22.
[122] *Ad Gentes*, Ch. 1, 3.
[123] *Dignitatis Humanae*, Introduction, 10.

this is St. Augustine who, in one of his views, held that all the heavenly bodies were created at the same time.

- The Fathers hold that light was created after the Earth, but this light preceded the light of the sun and stars, with the exception of Augustine notwithstanding.

The Fathers on the Geocentric Cosmos

Nota Bene: Many of the hundreds of citations from the Fathers regarding the motion of the sun have not been included in this list, due to the redundancy it would create. Only those quotes from the Fathers which have the most logical and comparative relevance have been listed. The names of the Fathers are listed in alphabetical order.

Ambrose: Worthy surely was he to stand forth as a man who might stay the course of the river, and who might say: "Sun, stand still," and delay the night and lengthen the day, as though to witness his victory. Why? a blessing denied to Moses, he alone was chosen to lead the people into the promised land. A man he was, great in the wonders he wrought by faith, great in his triumphs. The works of Moses were of a higher type, his brought greater success. Either of these then aided by divine grace rose above all human standing. The one ruled the sea, the other heaven.[124]

Ambrose: But they say that the sun can be said to be alone, because there is no second sun. But the sun himself has many things in common with the stars, for he travels across the heavens, he is of that ethereal and heavenly substance, he is a creature, and is reckoned amongst all the works of God. He serves God in union with all, blesses Him with all, praises Him with all. Therefore he cannot accurately be said to be alone, for he is not set apart from the rest.[125]

Anatolius of Alexandria: Eudemus relates in his Astrologies that Enopides found out the circle of the zodiac and the cycle of the great year. And Thales discovered the eclipse of the sun and its period in the tropics in its constant inequality. And Anaximander discovered that the earth is poised in space, and moves round the axis of the universe. And Anaximenes discovered that the moon has her light from the sun, and found out also the way in which she suffers eclipse. And the rest of the mathematicians have also made additions to these discoveries. We may instance the facts – that the fixed stars move round the axis passing through the poles, while the planets remove from each other round the perpendicular axis of the zodiac.[126]

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[124] *Duties of the Clergy*, Bk II, Ch XX, 99.

[125] Exposition of the Christian Faith, Bk V, Ch II.

Aphrahat: For the sun in twelve hours circles round, from the east unto the west; and when he has accomplished his course, his light is hidden in the night-time, and the night is not disturbed by his power. And in the hours of the night the sun turns round in his rapid course, and turning round begins to run in his accustomed path.[127]

Archeleus: When the light had been diffused everywhere, God began to constitute the universe, and commenced with the heaven and the earth; in which process this issue appeared, to wit, that the midst, which is the locality of earth covered with shadow, as a consequence of the interpositions of the creatures which were called into being, was found to be obscure, in such wise that circumstances required light to be introduced into that place, which was thus situated in the midst.[128]

Aristedes: They err who believe that the sky is a god. For we see that it revolves and moves by necessity and is compacted of many parts, being thence called the ordered universe (kosmos). Now the universe is the construction of some designer; and that which has been constructed has a beginning and an end. And the sky with its luminaries moves by necessity. For the stars are carried along in array at fixed intervals from sign to sign, and, some setting, others rising, they traverse their courses in due season so as to mark off summers and winters, as it has been appointed for them by God; and obeying the inevitable necessity of their nature they transgress not their proper limits, keeping company with the heavenly order. Whence it is plain that the sky is not a god but rather a work of God.[129]

Arnobius: Has the fabric of this machine and mass of the universe, by which we are all covered, and in which we are held enclosed, relaxed in any part, or broken up? Has the revolution of the globe, to which we are accustomed, departing from the rate of its primal motion, begun either to move too slowly, or to be hurried onward in headlong rotation? Have the stars begun to rise in the west, and the setting of the constellations to take place in the east?[130]

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[126] *The Paschal Canon*, XVII. Anaximander believed “The Earth…is held up by nothing, but remains stationary owing to the fact that it is equally distant from all other things.” (As obtained from Aristotle’s *De Caelo*, 295b32, cited in Popper’s *Conjectures and Refutations*, p. 138. Anaximander, however, understood the Earth to be in the shape of a drum rather than a globe.)

[127] *Demonstrations*, 24.

[128] *Disputation with Manes*, 22.

[129] *The Apology*, G IV.

Arnobius: The moon, the sun, the earth, the ether, the stars, are members and parts of the world; but if they are parts and members, they are certainly not themselves living creatures.[131]

Athanasius: For the Sun is carried round along with, and is contained in, the whole heaven, and can never go beyond his own orbit, while the moon and other stars testify to the assistance given them by the Sun…But the earth is not supported upon itself, but is set upon the realm of the waters, while this again is kept in its place, being bound fast at the center of the universe.[132]

Athanasius: For who that sees the circle of heaven and the course of the sun and the moon, and the positions and movements of the other stars, as they take place in opposite and different directions, while yet in their difference all with one accord observe a consistent order, can resist the conclusion that these are not ordered by themselves, but have a maker distinct from themselves who orders them? Or who that sees the sun rising by day and the moon shining by night, and waning and waxing without variation exactly according to the same number of days, and some of the stars running their courses and with orbits various and manifold, while others move without wandering, can fail to perceive that they certainly have a creator to guide them?[133]

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[130] *Against the Heathen*, Book 1, 2, 5. The Fathers understood “globe” (Latin: *mundi*) to refer to any spherical body, including the universe, the sun, the planets or the earth. If Arnobius had desired to confine the meaning to “earth” the more likely word he would have chosen is *terra*. The original Latin, beginning at “has the fabric of this macine” is: *numquid machinae huius et molis, qua universi tegimur et continemur inclusi, parte est in aliqua relaxata aut dissoluta constructio? numquid vertigo haec mundi, primigenii motus moderamen excedens, aut tardius repere aut praecipiti coepit volubilitate raptari*? Arnobius’ context, which refers to the “mass of the universe” and “the stars begun to rise,” is speaking of the globe of the universe.

[131] *Arnobius Against the Heathen*, Book 3, 350.

[132] *Against the Heathen*, Part 1, No. 27.

[133] *Against the Heathen*, Bk 1, Part III, 35.

For by a nod and by the power of the Divine Word of the Father that governs and presides over all, the heaven revolves, the stars move, the sun shines, the moon goes her circuit, and the air receives the sun's light and the aether his heat, and the winds blow: the mountains are reared on high, the sea is rough with waves, and the living things in it grow, the earth abides fixed..."[134]

Athanasius: For if the sun too, which was made by Him, and which we see, as it revolves in the heaven, is not defiled by touching the bodies upon earth, nor is it put out by darkness, but on the contrary itself illuminates and cleanses them also, much less was the all-holy Word of God, Maker and Lord also of the sun, defiled by being made known in the body; on the contrary, being incorruptible.[135]

Athenagoras: To Him is for us to know who stretched out and vaulted the heavens, and fixed the earth in its place like a center. [136]

Augustine: Let not the philosophers, then, think to upset our faith with arguments from the weight of bodies; for I don't care to inquire why they cannot believe an earthly body can be in heaven, while the whole earth is suspended on nothing. For perhaps the world keeps its central place by the same law that attracts to its center all heavy bodies.[137]

Augustine: For an eclipse of the sun had also happened; and this was attributed to the divine power of Romulus by the ignorant multitude, who did not know that it was brought about by the fixed laws of the sun's course.[138]

Augustine: This he said either of those things of which he had just been speaking, the succession of generations, the orbit of the sun, the course of rivers, or else of all kinds of creatures that are born and die.[139]

Augustine: What is there so arranged by the Author of the nature of heaven and earth as the exactly ordered course of the stars? What is there established by laws so sure and inflexible? And yet, when it pleased Him who with sovereignty and supreme power regulates all He has created, a star conspicuous among the rest by its size and splendor changed its color, size, form, and, most wonderful of all, the order and law of its course! Certainly that phenomenon disturbed the canons of the astronomers, if there were any then, by which they tabulate, as by unerring computation, the past and future movements of the stars, so as to take upon them to affirm that this which happened to the morning star (Venus) never happened before nor since. But we read in the divine books that even the sun itself stood still when a holy man, Joshua the son of Nun, had begged this from God until victory should finish the battle he had begun; and that it even went back, that the promise of fifteen years added to the life of king Hezekiah might be sealed by this additional prodigy. But these miracles, which were vouchsafed to the merits of holy men, even when our adversaries believe them, they attribute to magical arts; so Virgil, in the lines I quoted above, ascribes to magic the power to "Turn rivers backward to their source, And make the stars forget their course."[140]

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[134] *Against the Heathen*, Bk 1, Part III, 44.
[135] *Against the Heathen*, Book II, 17.
[136] *Why the Christians do not Offer Sacrifices*, Ch XIII.
[137] *City of God*, Bk XIII, Ch 18.
[138] *City of God*, Bk III, Ch 15.
[139] *City of God*, Bk XII, Ch 13.

Commentary: Some object that Augustine is wrong because the sun is not conspicuous for its size and splendor, since there are billions of stars as big or bigger than the sun. The fact is, science cannot prove that the stars are bigger than the sun, since even the strongest telescope sees every star only as a point of light. The "size" of a star is estimated based on various factors, all of which are theories, not proven scientific facts. Even in the realm of modern science, the sun is considered an average size star, with some star being much smaller and some being much bigger. More importantly, if for the sake of argument we agree that Augustine was wrong about the sun, still, the Church, under Pope Paul V and Pope Urban VIII during the trial of Galileo, did not say there was a patristic consensus on the size of the sun or that it was a matter of faith, since Scripture does not say that the sun is bigger or smaller than the stars. The only doctrine promulgated by the Church was that the sun moves around the earth and the earth is motionless. Augustine and the other Fathers had an absolute consensus on a motionless Earth because that is what Scripture clearly stated. Conversely, the Fathers did not have a consensus on the size of the stars.

Augustine: Who else save Joshua the son of Nun divided the stream of the Jordan for the people to pass over, and by the utterance of a prayer to God bridled and stopped the revolving sun? Who save Samson ever quenched his thirst with water flowing forth from the jawbone of a dead ass? Who save Elias was carried aloft in a chariot of fire?[141]

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[140] *City of God*, Book XXI, Ch 8.

Augustine: I desire to know the power and nature of time, by which we measure the motions of bodies, and say (for example) that this motion is twice as long as that. For, I ask, since "day" declares not the stay only of the sun upon the earth, according to which day is one thing, night another, but also its entire circuit from east even to east, according to which we say, "So many days have passed" (the nights being included when we say "so many days," and their spaces not counted apart), since, then, the day is finished by the motion of the sun, and by his circuit from east to east, I ask, whether the motion itself is the day, or the period in which that motion is completed, or both? For if the first be the day, then would there be a day although the sun should finish that course in so small a space of time as an hour. If the second, then that would not be a day if from one sunrise to another there were but so short a period as an hour, but the sun must go round four-and-twenty times to complete a day. If both, neither could that be called a day if the sun should run his entire round in the space of an hour; nor that, if, while the sun stood still, so much time should pass as the sun is accustomed to accomplish his whole course in from morning to morning. I shall not therefore now ask, what that is which is called day, but what time is, by which we, measuring the circuit of the sun, should say that it was accomplished in half the space of time it was wont, if it had been completed in so small a space as twelve hours; and comparing both times, we should call that single, this double time, although the sun should run his course from east to east sometimes in that single, sometimes in that double time. Let no man then tell me that the motions of the heavenly bodies are times, because, when at the prayer of one the sun stood still in order that he might achieve his victorious battle, the sun stood still, but time went on. For in such space of time as was sufficient was that battle fought and ended. I see that time, then, is a certain extension. But do I see it, or do I seem to see it? Thou, O Light and Truth, wilt show me.[142]

Basil: There are inquirers into nature who with a great display of words give reasons for the immobility of the earth...It is not, they go on, without reason or by chance that the earth occupies the center of the universe...Do not then be surprised that the world never falls: it occupies the center of the universe, its natural place. By necessity it is obliged to remain in its place, unless a movement contrary to nature should displace it. If there is anything in this system which might appear probable to you, keep your admiration for the source of such perfect order, for the wisdom of God. Grand phenomena do not strike us the less when we have discovered something of their wonderful mechanism. Is it otherwise here? At all events let us prefer the simplicity of faith to the demonstrations of reason.[143]

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[141] *Tractates*, XCI, Ch XV, 24-25, 2.
[142] *Confessions*, Bk XI, Ch XXIII, 30.

Basil: If the sun, subject to corruption, is so beautiful, so grand, so rapid in its move-meat, so invariable in its course; if its grandeur is in such perfect harmony with and due proportion to the universe: if, by the beauty of its nature, it shines like a brilliant eye in the middle of creation; if finally, one cannot tire of contemplating it, what will be the beauty of the Sun of Righteousness?[144]

Basil: From thence the sun, returning to the summer solstice, in the direction of the North, gives us the longest days. And, as it travels farther in the air, it burns that which is over our heads, dries up the earth, ripens the grains and hastens the maturity of the fruits of the trees.[145]

Basil: It will not lead me to give less importance to the creation of the universe, that the servant of God, Moses, is silent as to shapes; he has not said that the earth is a hundred and eighty thousand furlongs in circumference; he has not measured into what extent of air its shadow projects itself whilst the sun revolves around it, nor stated how this shadow, casting itself upon the moon, produces eclipses.[146]

Basil: In the midst of the covering and veil, where the priests were allowed to enter, was situated the altar of incense, the symbol of the earth placed in the middle of this universe; and from it came the fumes of incense.[147]

Basil: Like tops, which after the first impulse, continue their evolutions, turning upon themselves when once fixed in their center; thus nature, receiving the impulse of this first command, follows without interruption the course of ages, until the consummation of all things.[148]

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[143] *Nine Homilies on the Hexameron*, 10.

[144] *Homilies*, 6.

[145] *Homilies*, 6, 8.

[146] *Homilies*, IX.

[147] *The Mystic Meaning of the Tabernacle*, Bk V, Ch VI; Clement of Rome, *Stromata*, Bk V.

[148] *Homilies*, V, 10.

Basil: In the Beginning God made the Heaven and the Earth. **3.** Do not then imagine, O man! that the visible world is without a beginning; and because the celestial bodies move in a circular course, and it is difficult for our senses to define the point where the circle begins, do not believe that bodies impelled by a circular movement are, from their nature, without a beginning. Without doubt the circle (I mean the plane figure described by a single line) is beyond our perception, and it is impossible for us to find out where it begins or where it ends; but we ought not on this account to believe it to be without a beginning. Although we are not sensible of it, it really begins at some point where the draughtsman has begun to draw it at a certain radius from the center. Thus seeing that figures which move in a circle always return upon themselves, without for a single instant interrupting the regularity of their course, do not vainly imagine to yourselves that the world has neither beginning nor end. "For the fashion of this world passeth away" and "Heaven and earth shall pass away." The dogmas of the end, and of the renewing of the world, are announced beforehand in these short words put at the head of the inspired history. "In the beginning God made." That which was begun in time is condemned to come to an end in time. If there has been a beginning do not doubt of the end. Of what use to men are geometry, the calculations of arithmetic, the study of solids and far-famed astronomy, this laborious vanity, if those who pursue them imagine that this visible world is co-eternal with the Creator of all things, with God Himself; if they attribute to this limited world, which has a material body, the same glory as to the incomprehensible and invisible nature; if they cannot conceive that a whole, of which the parts are subject to corruption and change, must of necessity end by itself submitting to the fate of its parts? But they have become "vain in their imaginations and their foolish heart was darkened. Professing themselves to be wise, they became fools." Some have affirmed that heaven co-exists with God from all eternity; others that it is God Himself without beginning or end, and the cause of the particular arrangement of all things.

8. If I ask you to leave these vain questions, I will not expect you to try and find out the earth's point of support. The mind would reel on beholding its reasonings losing themselves without end. Do you say that the earth reposes on a bed of air? How, then, can this soft substance, without consistency, resist the enormous weight which presses upon it? How is it that it does not slip away in all directions, to avoid the sinking weight, and to spread itself over the mass which overwhelms it? Do you suppose that water is the foundation of the earth? You will then always have to ask yourself how it is that so heavy and opaque a body does not pass through the water; how a mass of such a weight is held up by a nature weaker than itself. Then you must seek a base for the waters, and you will be in much difficulty to say upon what the water itself rests.

9. Do you suppose that a heavier body prevents the earth from failing into the abyss? Then you must consider that this support needs itself a support to prevent it from failing. Can we imagine one? Our reason again demands yet another support, and thus we shall fall into the infinite, always imagining a base for the base which we have already found. And the further we advance in this reasoning the greater force we are obliged to give to this base, so that it may be able to support all the mass weighing upon it. Put then a limit to your thought, so that your curiosity in investigating the incomprehensible may not incur the reproaches of Job, and you be not asked by him, "Whereupon are the foundations thereof fastened?" If ever you hear in the Psalms, "I bear up the pillars of it" see in these pillars the power which sustains it. Because what means this other passage, "He hath founded it upon the sea" if not that the water is spread all around the earth? How then can water, the fluid element which flows down every declivity, remain suspended without ever flowing? You do not reflect that the idea of the earth suspended by itself throws your reason into a like but even greater difficulty, since from its nature it is heavier. But let us admit that the earth rests upon itself, or let us say that it rides the waters, we must still remain faithful to thought of true religion and recognize that all is sustained by the Creator's power. Let us then reply to ourselves, and let us reply to those who ask us upon what support this enormous mass rests, "In His hands are the ends of the earth." It is a doctrine as infallible for our own information as profitable for our hearers.[149]

Basil: The philosophers of Greece have made much ado to explain nature, and not one of their systems has remained firm and unshaken, each being overturned by its successor. It is vain to refute them; they are sufficient in themselves to destroy one another.[150]

John Cassian: He was a man who, after the close of his life had been decreed and the day of his death determined by the Lord's sentence, prevailed by a single prayer to extend the limits set to his life by fifteen years, the sun returning by ten steps, on which it had already shone in its course towards its setting, and by its return dispersing those lines which the shadow that followed its course had already marked, and by this giving two days in one to the whole world, by a stupendous miracle contrary to the fixed laws of nature. Yet after signs so great and so incredible, after such immense proofs of his goodness, hear the Scripture tell how he was destroyed by his very successes.[151]

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[149] *Nine Homilies of the Hexaemeron*, Homily I.

[150] *Nine Homiles of the Hexameron*, Homily 3, 2.

Chrysostom: "For they who are mad imagine that nothing stands still, yet this arises not from the objects that are seen, but from the eyes that see. Because they are unsteady and giddy, they think that the Earth turns round with them, which yet turns not, but stands firm. The derangement is of their own state, not from any affection of the element."[152]

Chrysostom: Dost thou not see how God is daily blasphemed and mocked by believers and unbelievers, both in word and in deed? What then? Has He for this extinguished the sun, or stayed the course of the moon? Has He crushed the heavens and uprooted the earth? Has He dried up the sea? Has He shut up the fountains of waters, or confounded the air? Nay, on the contrary, He makes His sun to rise, His rain to descend, gives the fruits of the earth in their seasons, and thus supplies yearly nourishment to the blasphemers, to the insensible, to the polluted, to persecutors; not for one day or two, but for their whole life. Imitate Him then, emulate Him as far as human powers admit. Can thou not make the sun arise?[153]

Chrysostom: And what took place at a later period were few and at intervals; for example, when the sun stood still in its course, and started back in the opposite direction. And this one may see to have occurred in our case also. For so even in our generation, in the instance of him who surpassed all in ungodliness, I mean Julian, many strange things happened. Thus when the Jews were attempting to raise up again the temple at Jerusalem, fire burst out from the foundations, and utterly hindered them all.[154]

Chrysostom: And again, David saith of the sun, that "he is as a bridegroom coming out of his chamber, and rejoiceth as a giant to run his course." Seest thou how he places before thee the beauty of this star, and its greatness? For even as a bridegroom when he appears from some stately chamber, so the sun sends forth his rays under the East; and adorning the heaven as it were with a saffron-colored veil, and making the clouds like roses, and running unimpeded all the day; he meets no obstacle to interrupt his course. Beholdest thou, then, his beauty?[155]

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[151] *Twelve Books on the Institutes*, Bk XI, Ch X.

[152] *Homily on Titus*, III.

[153] *Homilies on First Timothy*, Homily VI.

[154] *Homilies on Matthew*, Homily IV.

Chrysostom: For He not only made it, but provided also that when it was made, it should carry on its operations; not permitting it to be all immoveable, nor commanding it to be all in a state of motion. The heaven, for instance, hath remained immoveable, according as the prophet says, "He placed the heaven as a vault, and stretched it out as a tent over the earth." But, on the other hand, the sun with the rest of the stars, runs on his course through every day. And again, the earth is fixed, but the waters are continually in motion; and not the waters only, but the clouds, and the frequent and successive showers, which return at their proper season.[156]

Chrysostom: [Referring to the end of the world]: For the heaven shall be disturbed and the earth shall be shaken from its foundations by reason of the fury of the wrath of the Lord of Sabaoth, in the day when His wrath shall come upon us." And again "windows" he saith "shall be opened from the Heaven, and the foundations of the earth shall be shaken, the earth shall be mightily confounded, the earth shall be bent low, it shall be perplexed with great perplexity, the earth shall stagger grievously like the drunkard and the reveller; the earth shall shake as a hut, it shall fall and not be able to rise up again: for iniquity has waxed mighty therein. And God shall set His hand upon the host of the Heaven in the height in that day, and upon the kingdoms of the earth, and He shall gather together the congregation thereof into a prison, and shall shut them up in a stronghold." And Malachi speaking concordantly with these said" Behold the Lord almighty cometh, and who shall abide the day of His coming or who shall stand when He appeareth? for He cometh like a refiner's fire, and like fullers soap: and He shall sit refining and purifying as it were silver, and as it were gold."[157]

Chrysostom: Consider of how great value is the righteous man. Joshua the son of Nun said, "Let the sun stand still at Gibeon, the moon at the valley of Elom," and it was so. Let then the whole world come, or rather two or three, or four, or ten, or twenty worlds, and let them say and do this; yet shall they not be able. But the friend of God commanded the creatures of his Friend, or rather he besought his Friend, and the servants yielded, and he below gave command to those above. Seest thou that these things are for service fulfilling their appointed course? This was greater than the [miracles] of Moses. Why (I ask)? Because it is not a like thing to command the sea and the heavenly [bodies]. For that indeed was also a great thing, yea very great, nevertheless it was not at all equal [to the other]. Why was this? The name of Joshua [JESUS], was a type. For this reason then, and because of the very name, the creation reverenced him. What then! Was no other person called Jesus? [Yes]; but this man was on this account so called in type; for he used to be called Hoshea. Therefore the name was changed: for it was a prediction and a prophecy. He brought in the people into the promised land, as JESUS [does] into heaven; not the Law; since neither did Moses [bring them in], but remained without.[158]

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[155] *Homilies to Antioch*, Homily X.
[156] *Homilies to Antioch*, Homily XII.
[157] *Letters to Theodor*, Letter I, 12.

Chrysostom: Therefore it was, that Joshua, the son of Nun, said, "Let the sun stand still in Gibeon, and the moon over against the valley of Ajalon." And again the prophet Isaiah made the sun to retrace his steps, under the reign of Hezekiah; and Moses gave orders to the air, and the sea, the earth, and the rocks. Elisha changed the nature of the waters; the Three Children triumphed over the fire. Thou seest how God hath provided for us on either hand; leading us by the beauty of the elements to the knowledge of His divinity; and, by their feebleness, not permitting us to lapse into the worship of them.[159]

Clement of Rome: The sun and moon, with the companies of the stars, roll on in harmony according to His command, within their prescribed limits, and without any deviation.[160]

Commentary: Some object that Clement is incorrect since the moon's path changes and the distance to the Earth changes. Clement is correct, however, since the phrase "without deviation" does not refer to the few centimeters per year that the moon falls away from the earth, but to the "roll on in harmony," that is, to the fact that it continually revolves around the earth without fail, year after year. In either case, neither the Fathers nor the Church ever claimed a consensus or teaching on the moon's distance from the Earth, but only that the moon revolved around the Earth.

Clement of Rome: the Creator, long-suffering, merciful, the sustainer, the benefactor, ordaining love of men, counselling purity, immortal and making immortal, incomparable, dwelling in the souls of the good, that cannot be contained and yet is contained, who has fixed the great world as a centre in space, who has spread out the heavens and solidified the earth.[161]

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[158] *Homily on the Epistle to the Hebrews*, Homily VIII.

[159] *Homily to Antioch*, Homily X.

[160] *First Epistle to the Corinthians*, Ch XX.

Clement of Rome: For it is manifest even to the unbelieving and unskilful, that the course of the sun, which is useful and necessary to the world, and which is assigned by providence, is always kept orderly; but the courses of the moon, in comparison of the course of the sun, seem to the unskilful to be inordinate and unsettled in her waxings and wanings. For the sun moves in fixed and orderly periods: for from him are hours, from him the day when he rises, from him also the night when he sets; from him months and years are reckoned, from him the variations of seasons are produced; while, rising to the higher regions, he tempers the spring; but when he reaches the top of the heaven, he kindles the summer's heats: again, sinking, he produces the temper of autumn; and when he returns to his lowest circle, he bequeaths to us the rigour of winter's cold from the icy binding of heaven.[162]

Cyril of Jerusalem: And he, who could not hope to live because of the prophetic sentence, had fifteen years added to his life, and for the sign the sun ran backward in his course. Well then, for Hezekias' sake the sun turned back but for Christ the sun was eclipsed, not retracing his steps, but suffering eclipse, and therefore shewing the difference between them, I mean between Hezekias and Jesus.[163]

Cyril of Jerusalem: The earth, which bears the same proportion to the heaven as the center to the whole circumference of a wheel, for the earth is no more than this in comparison with the heaven: consider then that this first heaven which is seen is less than the second, and the second than the third, for so far Scripture has named them..."[164]

Ephraim the Syrian: The sun in his course teaches thee that thou rest from labour.[165]

Eusebius: The vast expanse of heaven, like an azure veil is interposed between those without, and those who inhabit his royal mansions: while round this expanse the sun and moon, with the rest of the heavenly luminaries (like torch-bearers around the entrance of the imperial palace), perform, in honor of their sovereign, their appointed courses; holding forth, at the word of his command, an ever-burning light to those whose lot is cast in the darker regions without the pale of heaven.[166]

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[161] *Homily* II, Ch XLV.
[162] *Pseudo-Clementine*, Bk VIII, Ch XLV
[163] *Catechetical Lectures*, II, 15.
[164] *Catechetical Lectures*, VI, 3.
[165] *On Admonition and Repentance*.

Eusebius: To whom he has permitted the contemplation of celestial objects, and revealed the course and changes of the sun and moon, and the periods of the planets and fixed stars.[167]

Eusebius: Even so one and the same impression of the solar rays illumines the air at once, gives light to the eyes, warmth to the touch, fertility to the earth, and growth to plants. The same luminary constitutes the course of time, governs the motions of the stars, performs the circuit of the heavens, imparts beauty to the earth, and displays the power of God to all: and all this he performs by the sole and unaided force of his own nature.[168]

Eusebius: The sun and the moon have their settled courses. The stars move in no uncertain orbit round this terrestrial globe.[169]

Gregory Nazianzus: But who gave him motion at first? And what is it which ever moves him in his circuit, though in his nature stable and immovable, truly unwearied, and the giver and sustainer of life, and all the rest of the titles which the poets justly sing of him, and never resting in his course or his benefits? How comes he to be the creator of day when above the earth, and of night when below it? Or whatever may be the right expression when one contemplates the sun?[170]

Gregory Nazianzus: The sun is extolled by David for its beauty, its greatness, its swift course, and its power, splendid as a bridegroom, majestic as a giant; while, from the extent of its circuit, it has such power that it equally sheds its light from one end of heaven to the other, and the heat thereof is in no wise lessened by distance.[171]

Commentary: Some object that Gregory is incorrect, since there would be a great difference in the heat on Mercury as opposed to Pluto. Gregory may be using "lessened" in the sence of "non-existent," that is, that a very distant planet will still take in heat from the sun, although it is a different amount of heat than it felt on Earth. In either case, neither the Fathers nor the Church ever claimed a consensus or teaching on the sun's heat.

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[166] *Oration of Constantine*, Ch 1.

[167] *Oration of Constantine*, Ch VI.

[168] *Oration of Constantine*, Ch XII.

[169] *Life of Constantine*, Bk II, Ch. LVIII.

[170] *Orations*, XXVIII, XXX.

[171] *Funeral Orations for St. Basil*, 66.

Gregory Nanzianzus: There have been in the whole period of the duration of the world two conspicuous changes of men's lives, which are also called two Testaments,(a) or, on account of the wide fame of the matter, two Earthquakes; the one from idols to the Law, the other from the Law to the Gospel. And we are taught in the Gospel of a third earthquake, namely, from this Earth to that which cannot be shaken or moved.[172]

Gregory of Nyssa: "This is the book of the generation of heaven and earth," saith the Scripture, when all that is seen was finished, and each of the things that are betook itself to its own separate place, when the body of heaven compassed all things round, and those bodies which are heavy and of downward tendency, the earth and the water, holding each other in, took the middle place of the universe; while, as a sort of bond and stability for the things that were made, the Divine power and skill was implanted in the growth of things, guiding all things with the reins of a double operation (for it was by rest and motion that it devised the genesis of the things that were not, and the continuance of the things that are), driving around, about the heavy and changeless element contributed by the creation that does not move, as about some fixed path, the exceedingly rapid motion of the sphere, like a wheel, and preserving the indissolubility of both by their mutual action, as the circling substance by its rapid motion compresses the compact body of the earth round about, while that which is firm and unyielding, by reason of its unchanging fixedness, continually augments the whirling motion of those things which revolve round it, and intensity is produced in equal measure in each of the natures which thus differ in their operation, in the stationary nature, I mean, and in the mobile revolution; for neither is the earth shifted from its own base, nor does the heaven ever relax in its vehemence, or slacken its motion.[173]

Commentary: Some object that Gregory is wrong in saying that the Earth is in the center of the universe because it is heavy and has a downward tendency. But we must recognize that the Fathers did not know all the scientific reasons for why things worked they way they do. This should be no surprise to moderns, since, to this very day, for example, modern science does not have an explanation for why an apple falls to the ground. All sceicen has done for the last three hundred years since Newton is give us an equation for how fast the apple moves downward. Again, the only thing of interest with regard to the Fathers and cosmology is their consensus that the Earth is motionless, since that fact is expressed as an inerrant piece of divine revelation in Scripture.

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[172] *Orations*, 5, xxv.

[173] *On the Making of Man*, 30, 1, 1.

Gregory of Nyssa: But, boasting as they do that they know these things, let them first tell us about the things of inferior nature; what they think of the body of the heavens, of the machinery which conveys the stars in their eternal courses, or of the sphere in which they move; for, however far speculation may proceed, when it comes to the uncertain and incomprehensible it must stop. For though any one say that another body, like in fashion (to that body of the heavens), fitting to its circular shape, checks its velocity, so that, ever turning in its course, it revolves conformably to that other upon itself, being retained by the force that embraces it from flying off at a tangent, yet how can he assert that these bodies will remain unspent by their constant friction with each other? And how, again, is motion produced in the case of two co-equal bodies mutually conformed, when the one remains motionless (for the inner body, one would have thought, being held as in a vice by the motionlessness of that which embraces it, will be quite unable to act); and what is it that maintains the embracing body in its fixedness, so that it remains unshaken and unaffected by the motion of that which fits into it?[174]

Gregory of Nyssa: And how does earth below form the foundation of the whole, and what is it that keeps it firmly in its place? What is it that controls its downward tendency? If any one should interrogate us on these and such-like points, will any of us be found so presumptuous as to promise an explanation of them? No! the only reply that can be given by men of sense is this: that He Who made all things in wisdom can alone furnish an account of His creation. For ourselves, "through faith we understand that the worlds were framed by the word of God," as saith the Apostle.[175]

Commentary: Some object that Gregory is incorrect because the Earth does not have a downward tendency. But Gregory does not mean that "downward tendency" is an actual motion downward but a force going against any attempt to move the earth in the opposite direction, thus allowing it to remain motionless. In either case, neither the Fathers nor the Church ever claimed a consensus or teaching on what keeps the Earth motionless; only that it is motionless.

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[174] *Answer to Eunomius' Second Book.*

[175] *Answer to Eunomius' Second Book.*

Gregory of Nyssa: "...the vault of heaven prolongs itself so uninterruptedly that it encircles all things with itself, and that the earth and its surroundings are poised in the middle, and that the motion of all the revolving bodies is round this fixed and solid center..."[176]

Gregory of Nyssa: And when you look at the waning and waxing moon you are taught other truths by the visible figure of that heavenly body, *viz.* that it is in itself devoid of light, and that it revolves in the circle nearest to the earth, and that it is lit by light from the sun; just as is the case with mirrors, which, receiving the sun upon them, do not reflect rays of their own, but those of the sun, whose light is given back from their smooth flashing surface. Those who see this, but do not examine it, think that the light comes from the moon herself. But that this is not the case is proved by this; that when she is diametrically facing the sun she has the whole of the disc that looks our way illuminated; but, as she traverses her own circle of revolution quicker from moving in a narrower space, she herself has completed this more than twelve times before the sun has once traveled round his; whence it happens that her substance is not always covered with light.[177]

Commentary: Some object that Gregory is incorrect because we now know that the planets move in an ellipse, not a circle. First, the planetary orbits are closer to circles than they are noticeable ellipses, so there is little wrong with estimating their orbits by characterizing them as circles. Second, modern science cannot prove the planets have elliptical orbits as opposed to circular orbits with various speeds in the orbit. What is known about planetary orbits is that the planet's speed changes. One way to explain the speed change is to attribute it to an elliptical orbit in which the planet would move faster at its perihelion than its aphelion. In either case, neither the Fathers nor the Church ever claimed a consensus or teaching on circular versus elliptical orbits.

Gregory Thaumaturgos: And the life of men weareth away, as day by day, and in the periods of hours and years, and the determinate courses of the sun, some are ever coming, and others passing away. And the matter is like the transit of torrents as they fall into the measureless deep of the sea with a mighty noise. And all things that have been constituted by God for the sake of men abide the same: as, for instance, in that man is born of earth, and departs to earth again; that the earth itself continues stable; that the sun accomplishes its circuit about it perfectly, and rolls round to the same mark again; and that the winds in like manner, and the mighty rivers which flow into the sea, and the breezes that beat upon it, all act without forcing it to pass beyond its limits, and without themselves also violating their appointed laws.[178]

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[176] *On the Soul and Resurrection.*

[177] *On the Soul and Resurrection.*

Hippolytus: When Hezekiah, king of Judah, was still sick and weeping, there came an angel, and said to him: "I have seen thy tears, and I have heard thy voice. Behold, I add unto thy time fifteen years. And this shall be a sign to thee from the Lord: Behold, I turn back the shadow of the degrees of the house of thy father, by which the sun has gone down, the ten degrees by which the shadow has gone down," so that day be a day of thirty-two hours. For when the sun had run its course to the tenth hour, it returned again. And again, when Joshua the son of Nun was fighting against the Amorites, when the sun was now inclining to its setting, and the battle was being pressed closely, Joshua, being anxious lest the heathen host should escape on the descent of night, cried out, saying, "Sun, stand thou still in Gibeon; and thou moon, in the valley of Ajalon," until I vanquish this people. And the sun stood still, and the moon, in their places, so that day was one of twenty-four hours. And in the time of Hezekiah the moon also turned back along with the sun, that there might be no collision between the two elemental bodies, by their bearing against each other in defiance of law. And Merodach the Chaldean, king of Babylon, being struck with amazement at that time, for he studied the science of astrology, and measured the courses of these bodies carefully – on learning the cause, sent a letter and gifts to Hezekiah, just as also the wise men from the east did to Christ.[179]

Hippolytus: We find in the commentaries, written by our predecessors, that day had thirty-two hours. For when the sun had run its course, and reached the tenth hour, and the shadow had gone down by the ten degrees in the house of the temple, the sun turned back again by the ten degrees, according to the word of the Lord, and there were thus twenty hours. And again, the sun accomplished its own proper course, according to the common law, and reached its setting. And thus there were thirty-two hours.[180]

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[178] *On Ecclesiastes*, Ch 1, 2.

[179] Fragments, I, *Discourse on Hezekiah*. Hippolytus' reference to "twenty-four hours" refers to the second leg of the forty-eight hour period of that unique long day.

Hippolytus: For what richer beauty can there be than that of the circle of heaven? And what form of more blooming fairness than that of earth's surface? And what is there swifter in the course than the chariot of the sun? And what more graceful car than the lunar orb? And what work more wonderful than the compact mosaic of the stars? And what more productive of supplies than the seasonable winds? And what more spotless mirror than the light of day? And what creature more excellent than man?[181]

Hippolytus: [Refuting the view of the Greek Ecphantus]: "And that the earth in the middle of the cosmical system is moved round its own center towards the east."[182]

Irenaeus: The sun also, who runs through his orbit in twelve months, and then returns to the same point in the circle.[183]

Jerome: In Exodus we read that the battle was fought against Amalek while Moses prayed, and the whole people fasted until the evening. Joshua, the son of Nun, bade sun and moon stand still, and the victorious army prolonged its fast for more than a day.[184]

Jerome: The moon may dispute over her eclipses and ceaseless toil, and ask why she must traverse every month the yearly orbit of the sun. The sun may complain and want to know what he has done that he travels more slowly than the moon.[185]

John Damascene: For it is night when the sun is under the earth, and the duration of night is the course of the sun under the earth from its rising till its setting.[186]

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[180] Fragments, III, *Discourse on Hezekiah.*

[181] *Discourse on the Holy Theophany*, 1.

[182] *The Prooemium*, Ch XIII.

[183] *Against Heresies*, Bk I, Ch XVII, 1.

[184] *Against Jovinianus*, Bk 2.

[185] *Against the Pelagians*, Bk I, 1, 9.

[186] *The Orthodox Faith*, Bk 2, Ch 7.

Justin Martyr: The former, after he had been named Jesus (Joshua), and after he had received strength from His Spirit, caused the sun to stand still.[187]

Justin Martyr: And again, when the land was given up to you with so great a display of power, that you witnessed the sun stand still in the heavens by the order of that man whose name was Jesus (Joshua), and not go down for thirty-six hours, as well as all the other miracles which were wrought for you as time served; and of these it seems good to me now to speak of another, for it conduces to your hereby knowing Jesus, whom we also know to have been Christ the Son of God, who was crucified, and rose again, and ascended to heaven, and will come again to judge all men, even up to Adam himself.[188]

Mathetes: By whom He made the heavens, by whom he enclosed the sea within its proper bounds, whose ordinances all the stars faithfully observe, from whom the sun has received the measure of his daily course to be observed, whom the moon obeys, being commanded to shine in the night, and whom the stars also obey, following the moon in her course; by whom all things have been arranged, and placed within their proper limits.[189]

Methodius: And, of a truth, it seemed worth while to inquire also about the sun, what is the manner of his being set in the heaven; also what is the orbit he traverses; also whither it is that, after a short time, he retires; and why it is that even he does not go out of his proper course: but he, too, as one may say, is observing a commandment of a higher power, and appears with us just when he is allowed to do so, and departs as if he were called away.[190]

Methodius: Resuming then, let us first lay bare, in speaking of those things according to our power, the imposture of those who boast as though they alone had comprehended from what forms the heaven is arranged, in accordance with the hypothesis of the Chaldeans and Egyptians. For they say that the circumference of the world is likened to the turnings of a well-rounded globe, the earth having a central point. For its outline being spherical, it is necessary, they say, since there are the same distances of the parts, that the earth should be the center of the universe, around which, as being older, the heaven is whirling. For if a circumference is described from the central point, which seems to be a circle, for it is impossible for a circle to be described without a point, and it is impossible for a circle to be without a point, surely the earth consisted before all, they say, in a state of chaos and disorganization.[191]

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[187] *Dialogue with Trypho*, Ch CXIII.

[188] *Dialogue with Trypho*, Ch CXXXII.

[189] *To Diognetes*, Ch 7.

[190] *Concerning Free Will.*

Minucius Felix: Look also on the year, how it is made by the circuit of the sun; and look on the month, how the moon drives it around in her increase, her decline, and decay.[192]

Tertullian: In Exodus, was not that position of Moses, battling against Amalek by prayers, maintained as it was perseveringly even till "sunset," a "late Station?" Think we that Joshua the son of Nun, when warring down the Amorites, had breakfasted on that day on which he ordered the very elements to keep a Station? The sun "stood" in Gibeon, and the moon in Ajalon; the sun and the moon "stood in station until the People was avenged of his enemies, and the sun stood in the mid heaven." When, moreover, (the sun) did draw toward his setting and the end of the one day, there was no such day beforetime and in the latest time (of course, (no day) so long), "that God," says (the writer), "should hear a man" – (a man,) to be sure, the sun's peer, so long persistent in his duty – a Station longer even than late.[193]

Memoirs of Edessa: For look at the sun, and the moon, and the signs of the zodiac, and all the other creatures which are greater than we in some points, and see how individual freedom has been denied them, and how they are all fixed in their course by decree, so that they may do that only which is decreed for them, and nothing else. For the sun never says, I will not rise at my appointed time; nor the moon, I will not change, nor wane, nor wax; nor does any one of the stars say, I will not rise nor set.[194]

Alphonsus Ligouri (d 1787): "Let us observe the sun, which with great speed goes around the Earth, and without ever varying its course." (*Verità della Fede*, Cap III, 548, Latin: "Osserviamo il sole, che con velocissimo moto gira la terra, e senza mai variare il suo corso divide deversamente…")

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[191] *Banquet of the Ten Virgins*, Discourse VIII, Ch XIV.

[192] *Octavius*, Ch xvii.

[193] *On Fasting*, Ch X.

[194] *Book of the Laws*.

The Consensus of Church Fathers and Medieval Theologians

The Length of the Day in Genesis 1 as 24-Hours

Of the Fathers which commented on Genesis 1, the majority specify that they understand the "day" as a 24-hour period, the portion of a week, or some other specific or literal designation which is not a long period of time.[195]

Basil: "Thus were created the evening and the morning. Scripture means the space of a day and a night….If it therefore says 'one day,' it is from a wish to determine the measure of day and night, and to combine the time that they contain. Now twenty-four hours fills up the space of one day – we mean of a day and of a night."[196]

Gregory of Nyssa: Gregory confirms the views of Basil on the details of the Creation in the following passage: "Before I begin, let me testify that there is nothing contradictory in what the saintly Basil wrote about the creation of the world since no further explanation is needed. They should suffice and alone take second place to the divinely inspired Testament. Let anyone who hearkens to our attempts through a leisurely reading be not dismayed if they agree with our words. We do not propose a dogma which gives occasion for calumny; rather, we wish to express only our own insights so that what we offer does not detract from the following instruction. Thus let no one demand from me questions which seem to fall in line with common opinion either from holy Scripture or explained by our teacher. My task is not to fathom those matters before us which appear contradictory; rather, permit me to employ my own resources to understand the text's objective. With God's help we can fathom what the text means which follows a certain defined order regarding creation. 'In the beginning God created the heavens and the earth' [Gn 1:1], and the rest which pertains to the cosmogenesis which the six days encompass."[197]

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[195] One author noted his exasperation in finding anything but a literal interpretation in the Fathers, stating: "It was too speculative and difficult to appeal to the majority, who preferred to believe that the six days were really periods of time" (F. E. Robbins, *The Hexaemeral Literature*. University of Chicago, 1911, p. 22). Similarly, Stanley Jaki admits: "As I reviewed one after another the great commentaries on Genesis 1, I could not help feeling how close their authors were time and again to an interpretation which is strictly literal and yet at the same time puts that marvelous story at safe remove from any comparison with science, old and new" (*Genesis 1 Through the Ages*, p. xii).

[196] *Hexameron* 2, 8.

Ambrose: "But Scripture established a law of twenty-four hours, including both day and night, should be given the name of day only, as if one were to say the length of one day is twenty-four hours in extent."[198] "In the beginning of time, therefore God created heaven and earth. Time proceeds from this world, not before the world. And the day is a division of time, not its beginning."[199] "But now we seem to have reached the end of our discourse, since the 6th day is completed and the sum total of the work has been concluded."[200]

Victorinus: "The Creation of the World: In the beginning God made the light, and divided it in the exact measure of twelve hours by day and by night, for this reason, doubtless, that day might bring over the night as an occasion of rest for men's labours; that, again, day might overcome, and thus that labour might be refreshed with this alternate change of rest, and that repose again might be tempered by the exercise of day. "On the fourth day He made two lights in the heaven, the greater and the lesser, that the one might rule over the day, the other over the night."[201]

Ephrem the Syrian: "'In the beginning God created the heaven and the earth,' that is, the substance of the heavens and the substance of the earth. So let no one think that there is anything allegorical in the works of the six days. No one can rightly say that the things that pertain to these days were symbolic."[202]

Theophilus: "Of this six days' work no man can give a worthy explanation and description of all its parts...on account of the exceeding greatness and riches of the wisdom of God which there is in the six days' work above narrated."[203]

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[197] *Hexaemeron*, PG 44:68-69, translated by Richard McCambly. Eustathius (270-337), Bishop of Antioch, called Basil's commentary on Genesis 1 an "overall great commentary" (PG 18, cols 705-707).

[198] *Hexameron* 1:37, FC 42:42.

[199] *Hexameron* 1:20, FC 42:19.

[200] *Hexameron* 6:75, FC 42:282.

[201] *On the Creation of the World*, NPNF1, vol. 7, pp. 341-343.

[202] *Commentary on Genesis,1:1*, FC 91:74

[203] *Autolycus* 2,12.

Irenaeus: "For in as many days as this world was made, in so many thousand years shall it be concluded….For the day of the Lord is as a thousand years; and in six days created things were completed: it is evident, therefore, that they will come to an end at the sixth thousand year."[204]

Among the Fathers, several of them show the same chronology in their eschatological view, that is, that, prophetically speaking, a day equates to one thousand years. Regardless whether the Fathers' view of a six-millennium span for the world is correct, the only important fact for our purposes is that the 'day = 1000 years' schema confirms the Fathers' belief that a day in Genesis 1 is less than one thousand years, and more specifically, that the day is precisely 24-hours. In other words, these Fathers did not believe that a day of Genesis was 1000 years. Their formula is certainly not 1000 years in Genesis 1 = 1000 years of the earth's longevity; rather, a single day of 24 hours in Genesis = 1000 years of the earth's longevity.[205]

Lactantius: "God completed the world and this admirable work of nature in the space of six days, as is contained in the secrets of Holy Scripture, and consecrated the seventh day….For there are seven days, by the revolutions of which in order the circles of years are made up….Therefore, since all the works of God were completed in six days, the world must continue in its present state through six ages, that is, six thousand years...For the great day of God is limited by a circle of a thousand years, as the prophet shows, who says, 'In Thy sight, O Lord, a thousand years are as one day.' And as God labored during those six days in creating such great works, so His religion and truth must labor during these six thousand years."[206]

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[204] *Against Heresies* 5, 28, 3.

[205] Although it is true that Augustine had at one time adopted the day = 1000 years schema, yet believed that the days of Genesis were figurative, that is, accomplished in one instant rather than over six days, he later rejected the day = 1000 years schema. He writes: "...and they allege that this period may be defined six thousand years, as of six days. Nor have they heeded the words, 'are but as one day which is past by' for, when this was uttered, not a thousand years only had passed, and the expression, 'as a watch in the night,' ought to have warned them that they might not be deceived by the uncertainty of the seasons: for even if the six first days in which God finished His works seemed to give some plausibility to their opinion, six watches, which amount to eighteen hours, will not consist with that opinion." (On the Psalms, Psalm 90, NPNF, vol. 8, p. 442).

[206] *Institutes* 7, 14.

Here we notice how Lactantius, as other Fathers, believes in a six-thousand year time-span for the existence of the present heaven and earth. In order to arrive at this calculation, Lactantius must first understand the days of Genesis as twenty-four hour periods, which can then, by application of the "prophets" words, be an analogical prediction to the time of the demise of the Creation.

Methodius: "For you seem to me, O Theophila, to have discussed those words of the Scripture amply and clearly, and to have set them forth as they are without mistake. For it is a dangerous thing wholly to despise the literal meaning, as has been said, and especially of Genesis, where the unchangeable decrees of God for the constitution of the universe are set forth, in agreement with which, even until now, the world is perfectly ordered, most beautifully in accordance with a perfect rule, until the Lawgiver Himself having re-arranged it, wishing to order it anew, shall break up the first laws of nature by a fresh disposition. But, since it is not fitting to leave the demonstration of the argument unexamined – and, so to speak, half-lame – come let us, as it were completing our pair, bring forth the analogical sense, looking more deeply into the Scripture; for Paul is not to be despised when he passed over the literal meaning, and show that the word extend to Christ and the Church.[207]

Clement of Alexandria: "For the creations on the different days followed in a most important succession; so that all things brought into existence might have honor from priority, created together in thought, but not being of equal worth. Nor was the creation of each signified by the voice, inasmuch as the creative work is said to have made them at once. For something must needs have been named first. Wherefore those things were announced first, from which came those that were second, all things being originated together from one essence by one power."[208]

One can get a clearer picture of how literally Clement interprets Scriptural numbers in Book 1, Ch. 21 of the *Stromata*. There he enumerates a long series of chronological data. For our purposes, Clement specifies the length of time from Adam to Noah's Flood to the very day:

Clement: "From Adam to the deluge are comprised two thousand one hundred and forty-eight years, four days."[209]

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[207] *Banquet of the Ten Virgins*, Discourse III, Ch 2.

[208] *Stromata*, Book VI, Ch 16.

[209] Stromata, Book 1, Ch. 21 (ANF, Vol. 2, p. 332).

This would necessarily mean that Clement would have considered the first day of the above enumeration as beginning on the sixth day of creation, which would mean that the seventh day would be the second day, and so on.

Epiphanius: "Adam, who was fashioned from the earth on the sixth day and received breath, became a living being (for he was not, as some suppose, begun on the fifth day, and completed on the sixth; those who say have the wrong idea), and was simple and innocent, without any other name."[210]

Julius Africanus: "For the Jews, deriving their origin from them as descendants of Abraham, having been taught a modest mind, and one such as becomes men, together with the truth by the spirit of Moses, have handed down to us, by their extant Hebrew histories, the number 5,500 years as the period up to the advent of the Word of salvation, that was announced to the world in the time of the sway of the Caesars."[211]

In the same fragment, Julius explains that he understands the numbers of Genesis literally.

Julius Africanus: "Adam, when 230 years old, begets Seth; and after living another 700 years he died, that is, a second death (Fragment III); God decreed to destroy the whole race of the living by a flood, having threatened that men should not survive beyond 120 years.…For the space of time meant was 100 years up to the flood in the case of the sinners of that time; for they were 20 years old (Fragment IV); Noe was 600 years old when the flood came on. From Adam, therefore, to Noe and the flood, are 2262 years."[212]

Cyril of Jerusalem: "**In six days** God made the world.…The sun, however resplendent with bright beams, yet was made to give light to man, yea, all living creatures were formed to serve us: herbs and trees were created for our enjoyment...The sun was formed by a mere command, but man by God's hands."[213] "...but the earth is from the waters: and before the whole six days' formation of the things that were made, the Spirit of God moved upon the face of the water. The water was the beginning of the world...”[214]

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[210] *Panarion* 1:1, translated by Phillip R. Amidon.

[211] Extant Fragments, III, 1.

[212] Fragment V.

[213] *Catechetical Lectures* 12, 5.

Hippolytus: “But it was right to speak not of the ‘first day,’ but of ‘one day,’ in order that by saying ‘one,’ he might show that it returns on its orbit, and, while it remains one, makes up the week....On the first day God made what He made out of nothing.”[215]

Hippolytus also critiques the Greek philosophers for allegorizing the days of Genesis. He writes:

Hippolytus: “When, therefore, Moses has spoken of ‘the six days in which God made heaven and earth’...Simon, in a manner already specified, giving these and other passages of Scripture a different application from the one intended by the holy writers, deifies himself. When, therefore, the followers of Simon affirm that there are three days begotten before sun and moon, they speak enigmatically.”[216]

Hippolytus, as did some of the other Fathers who believed that the world would end in 6,000 years, shows his belief in a literal six days of creation by equating them with the 6,000 years. He writes: “Since, then, in six days God made all things, it follows that 6,000 years must be fulfilled.”[217]

Chrysostom: “Acknowledging that God could have created the world ‘in a single day, nay in a single moment,’ he chose ‘a sort of succession and established things by parts’...so that, accurately interpreted by that blessed prophet Moses, we do not fall in with those who are guided by human reasonings."[218]

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[214] *Catechetical Lectures*, 3, 5.

[215] Genesis 1:5, 1:6; ANF, vol. 5, p. 163.

[216] *Refutation of All Heresies*, Book VI, Ch IX

[217] Expressing a similar idea is the Donatist bishop, Tyconius: “Moreover, just as the whole time is reckoned in the first part of any time period, so also the last hour is reckoned as a whole day, or what is left of a thousand years is reckoned as a thousand years. The world’s age is six days, that is, six thousand years. In what is left of the sixth day, that is, of these 1000 years, the Lord was born, suffered and rose again.” (*The book of Rules*, 5); and Firmicus Maternus: “For after long ages, in the last reaches of time, that is, almost at the end of the week of the centuries, the Word of God commingled Itself with human flesh, to save mankind, to conquer death, to link the frailty of the human body with divine immortality.” (*The Error of the Pagan Religions*, 25:3). Hilary of Poitiers (315-367) does the same in *Commentary on Matthew* 17:1; 20:6; and *Tractatus* 1, 41; 2, 10 on his belief that the world would last 6000 years.

Athanasius: "For as to the separate stars or the great lights, not this appeared first, and that second, but in one day and by the same command, they were all called into being. And such was the original formation of the quadrupeds, and of birds, and fishes, and cattle, and plants; thus too has the race made after God's Image come to be, namely men; for though Adam was formed out of earth, yet in him was involved the succession of the whole race."[219]

We notice that Athanasius specifies that on the day the stars were made they were not made separately; rather, "in one day and by the same command, they were all called into being..." The same, of course, would be true on the fifth day when, as Athanasius says, "the quadrupeds, and of birds, and fishes, and cattle..." were made. By the words, "same command" Athanasius is not saying that the stars and animals were created together, but that each category of creation was made in one day by a specific command on that day. This is confirmed also in II, 49 as he says, "for it was not first one and then another, but all at once were constituted after their kinds." "Kinds" refers to the specific creatures being made, as Athanasius goes on to say in the remainder of the context.

Athanasius: "We begin the holy fast on the fifth day...and adding to it according to the number of those six holy and great days, which are the symbol of the creation of the world, let us rest and cease from fasting on the tenth day of the same...on the holy sabbath of the week."[220]

The other Fathers who comment on Genesis 1 do not specify the length of a day.[221] There is only one patristic witness, however, who specifically and explicitly held that the days of Genesis were figurative. Origen, who is considered on the lower rung of patristic authority, had, because of his influence from the Greek Philo, interpretations of Scripture that were consistently prone to allegory at the expense of the literal meaning.

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[218] PG, *Homily* 3, col 35.

[219] *Discourse Against the Arians*, Discourse II, 48.

[220] *Easter Letter*, 10

[221] Conspicuously absent from this long list of Fathers is Jerome, a contemporary of Augustine, and one of the Church's greatest exegetes of Scripture. Unfortunately, even though he had a superior knowledge of the original Hebrew, Jerome did not offer any detailed discussion on the six-day creation in Genesis 1. The only remarks come from his essay titled *Hebraic Questions about Genesis* which includes only four short remarks on Genesis 1 (that "in the beginning" referred to Christ; the *ruach* hovering referred to the Holy Spirit; a remark about the gathering of waters; and that the seventh day was not a complete day of rest).

Origen: "Now who is there, pray, possessed of understanding, that will regard the statement as appropriate, that the first day, and the second, and the third, in which also both evening and morning are mentioned, existed without sun, and moon, and stars – the first day even without a sky. And who is found so ignorant as to suppose that God, as if He had been a husbandman, planted trees in paradise....The same style of Scriptural narrative occurs abundantly in the Gospels, as when the devil is said to have placed Jesus on a lofty mountain, that he might show Him from thence all the kingdoms of the world.…And many other instances similar to this will be found in the Gospels by any one who will read them with attention, and will observe that in those narratives which appear to be literally recorded, there are inserted and interwoven things which cannot be admitted historically, but which may be accepted in a spiritual signification."[222]

Augustine: Although Augustine entertained a six day creation in the early part of *The Literal Meaning of Genesis* (published in 400 A.D.), he felt there were too many difficulties with it and he ended up favoring a one-day creation in which everything was created simultaneously. In his book *Retractationes*, Augustine remarked on his original effort to form a literal interpretation of Genesis 1 in his work *Genesis Against the Manicheans*, written in 388 A.D. He intended Genesis 1 to be a literally interpreted but with the resignation, "there are more questions raised than answers found and of the answers found not many have been established for certain."[223]

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[222] *De Principiis*, Book IV, Ch 1; ANF, v. 4, p. 365.

[223] Various evolutionists who reference the Fathers hold that Augustine actually believed in evolution. Eldon J. Gardner of Utah State University writes: "St. Augustine...favored an allegorical interpretation of the book of Genesis in the Bible and openly promoted an evolutionary concept as opposed to special creation" (*History of Life Science*, Burgess, 1960, p. 93). Henry Fairfield Osborn of Columbia University and the American Museum of Natural History writes that Augustine "sought a naturalistic interpretation of the Mosaic record...and taught that in the institution of nature we should not look for miracles but for the laws of nature" (*From the Greeks to Darwin*, 2nd ed. Charles Scribner and Sons, 1929, p. 11). In the college textbook *Principles of Organic Evolution*, evolutionist Arthur Ward Lindsay of Dennison University writes: "...several of the church fathers expressed ideas of organic evolution even though the trend of ecclesiastical thought led more readily into other lines of reasoning." He claims that Gregory of

One of his Augustine's chief difficulties regarded the creation of the angels, since neither Genesis 1 or 2 specified *when* they were created. For his own reasons, many of them due to his penchant for Platonism and his fearlessness to ask how things came to be as they are, Augustine felt obliged to include the angels somewhere in the Genesis 1 narrative.[224] Thus he postulated that the creation of Light in Genesis 1:3 referred to the angels.[225] He writes:

> What then is the meaning of the repetition in the case of the other works? Perhaps we have here an indication that on the first day, the day on which the light was made, under the term "light" is revealed the creation of spiritual and intellectual creatures, by which we understand all the holy angels and virtues....It is no wonder that when the holy angels were formed by the first creation of light, God first showed them that He was going to create the works to follow. And indeed they would not have

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Nyssa, Basil, Augustine and Aquinas "expressed belief in the symbolic nature of the Biblical story of creation and in their comments made statements clearly related to the concept of evolution" (C. V. Mosby, 1952, p. 21). Hugh Ross, a Christian theistic evolutionist, cites the same personalities in his book *The Fingerprint of God*, 2 nd ed. (Promise, 1991, pp. 141ff). W. R. Thompson, Ph.D., a Catholic Creationist, who wrote a now famous 14-page introduction to a 1955 edition of Darwin's *Origin of Species* which challenged evolution's credibility, writes: "As early as 1921, Canon H. de Dolodot in *La Darwinisme*, issued under the auspices of the University of Louvain, cites St. Augustine as holding as certain the theory of absolute natural evolution of living being to the human body itself."

[224] One of Augustine's favorite verses was Wisdom 11:20 "But you have disposed all things by measure and number and weight." He writes: "Now we are seeking to know whether the Creator, who has ordered all things in measure, and number, and weight, has assigned to the waters not just one proper place around the earth, but another also above the heavens, a region which has been spread around and established beyond the limits of the air" (*Confessions*, Bk 2, Ch 1, 2).

[225] On this question, Aquinas cites Basil, Strabus and Bonaventure: "The empyrean heaven rests only on the authority of Strabus and Bede, and also of Basil; all of whom agree in one respect, namely, in holding it to be the place of the blessed. Strabus and Bede say that as soon as it was created it was filled with angels; and Basil (Hom. 2 in *Hexaemeron*) says: 'Just as the lost are driven into the lowest darkness, so the reward for worthy deeds is laid up in the light beyond this world, where the just shall obtain the abode of rest.'" *Summa Excursion*, Creation in Six Days, Ques. 66, Art. 3. Zwingli was the only other exegete to hold that the light of Genesis 1:3 referred to the angels.

> known the mind of God except in so far as He Himself had revealed it to them.[226]

Using this as his anchor, Augustine proceeds to interpret the rest of Genesis 1. He then reasons that, since Genesis 1 does not mention the "night" in any of its days, this suggests that the focus is on the "day." He writes:

> The angels...have been made to share in the truth. Through all six days, therefore, no mention is made of night, but after the evening and morning there is one day; again after evening and morning, another day.…These days have their nights, but it is the days, not the nights, that are described. For night belongs to day, not day to night, when the holy angels of heaven refer their knowledge of creatures in themselves to the honor and love of Him in whom they contemplate the eternal reasons by which creatures were made.[227]

He says very much the same in the *City of God* written some two decades later:

> ...which is the name given to the sky between the waters above and those beneath, that is the second day; when in the knowledge of the earth, and the sea, and all things that grow out of the earth, that is the third day; when in the knowledge of the greater and less luminaries, and all the stars, that is the fourth day; when in the knowledge of all animals that swim in the waters and that fly in the air, that is the fifth day; when in the knowledge of all animals that live on the earth, and of man himself, that is the sixth day.[228]

From this he reasons that all creation was made simultaneously. He writes:

> Hence, we can no longer take "day" to mean the form of the work created and "evening" its completion and "morning" the beginning of another work in the account of creation...But that day, which God has made, recurs in connection with His works

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[226] *Literal Meaning of Genesis*, Bk. 2, Ch 8, Nos.16-18.

[227] *Literal Meaning of Genesis*, Bk 4, Ch 25, No. 42.

[228] *City of God*, Bk XI, Ch 7.

> not by a material passage of time but by spiritual knowledge, when the blessed company of angels contemplate from the beginning in the Word of God the divine decree to create...Finally, they refer this knowledge of the creature to the praise of eternal Truth, where they had beheld the form of the work to be produced, and this is the meaning of the statement that it was morning. Thus, in all the days of creation there is one day, and it is not to be taken in the sense of our day, which we reckon by the course of the sun.[229]

It is apparent that Augustine more of less forces himself to reject the passage of six literal days due to his self-imposed requirement to include the angels in Genesis 1. Whether inadvertently or by design, the angels become Augustine's central focus in Genesis 1, since everything that is made is arranged for their contemplation. In effect, once the angels are included in Genesis 1:3, everything else in the chapter must fit in, and Augustine does his best to make them fit.

Although Augustine had a penchant for mixing spiritual and literal interpretations in his biblical exegesis,[230] his attempt at such a methodology in Genesis 1 is very unusual, as even he admits. Even though Augustine makes a concerted effort to fashion a literal interpretation of Genesis, throughout the discourse he slips into many spiritual interpretations, often catching himself, after long spiritual descriptions, to get back on track with the literal interpretation. Because of the difficulties that Augustine imagined with a strict literal interpretation of Genesis, whether by design or habit, the spiritual interpretations become somewhat of a controlling factor in his understanding, the most prominent, of course, is his conclusion to interpret the light of Genesis as a reference to angels. As such, Augustine is isolated from all the rest of the Fathers. It can be safely concluded that Augustine did not get his interpretation of Genesis 1 from Tradition. In fact, no Father before Augustine had an overriding concern about *when* the angels were created, and Scripture itself did not seem to share the concern.

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[229] *Ibid*, Ch 26, No. 43.

[230] Augustine writes: "Brethren, I must tell you, and teach you according to my poor abilities, which the Lord giveth me for your benefit, and must convey to you what ye may hold as a rule in the interpretation of all Scripture. Everything that is said or done is to be understood either in its literal signification, or else it signifies something figuratively; or at least contains both of these at once, both its own literal interpretation, and a figurative signification also" (*Sermons*, xxxix). "Wherefore, though light and darkness are to be taken in their literal signification in these passages of Genesis in which it is said, "God said, Let there be light, and there was light," and "God divided the light from the darkness," yet, for our part, we understand these two societies of angels, the one enjoying God, the other swelling with pride..." (*City of God*, Bk XI, Ch 33).

As the anomalies in Augustine's view mount, his interpretation becomes increasingly difficult to accept. In Scripture, man's creation is specified with the words "and let us make man in our image," as well as being reiterated throughout Scripture (Gn 5:1; Dt 4:32; Is 45:12; Ec 7:29; Jm 3:9). If, as Augustine claims, the angels are the focus of the first verses of Genesis 1, then why would the text not just mention the word "angels" as even Genesis 1:26 mentions the word "man" when man is created? What is to be gained for the ancient writer by being so cryptic, especially when everything else in the chapter is called by its common name? Moreover, "light" is never specifically identified with angels in Scripture. If there is mention of luminous bodies as representing angels (Jb 38:7), men and God are also signified as such (2Pt 1:19; Ap 22:16; Ml 4:2), and thus, spiritually speaking, there is no distinction for the angels in regard to light. In addition, Scripture makes no issue of "angelic contemplation." All in all, Augustine's self-imposed "angelic" interpretation puts a tremendous strain on the rest of Genesis 1's details, and it appears that it is a burden that the text simply cannot bear.

But Augustine has another "proof text" for his view. He begins by posing the following question:

> But if the angelic mind can grasp simultaneously all that the sacred text sets down separately in an ordered arrangement according to causal connection, were not all these things also made simultaneously, the firmament itself, the waters gathered together and the bare land that appeared, the plants and trees that sprang forth, the lights and the stars that were established, the living creatures in the water and on the earth? Or were they rather created at different times on appointed days?[231]

Then Augustine brings his proof text:

> In this narrative of creation [Genesis 1-2] Holy Scripture has said of the Creator that He completed His works in six days; and elsewhere, without contradicting this, it has been written of the same Creator that He created all things together. It follows, therefore, that He, who created all things together,

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[231] *Literal Meaning of Genesis*, Bk. 4, Ch. 33, No 51.

> simultaneously created these six days, or seven, or rather the one day six or seven times repeated.[232]

We notice that Augustine is not quite sure how the simultaneity of creation works itself out numerically. Be that as it may, Augustine's citation of "...and elsewhere...it has been written...He created all things together" is referring to Sirach (Ecclesiasticus) 18:1. The Greek of the Septuagint reads: ὀ ζῶν εἰς τὸν αἰῶνα ἔκτισεν τὰ πάντα κοινῇ ("He who lives forever has created all things in common"). The word in question is κοινῇ (koine), which normally means "in common" or "without exception." But the Latin Vulgate from which Augustine read had translated κοινῇ with the words *omnia simul* in the sentence, "qui vivit in aeternum creavit *omnia simul* Deus solus iustificabitur et manet invictus rex in aeternum."[233] The clause *omnia simul* means "at one time" or "altogether," but this is obviously a questionable translation of the Greek κοινῇ. Sirach 18:1, at least in the original Greek, is not saying that creation was made simultaneously or altogether, but of all that was made the Lord created it all, without exception. The context of the passage certainly bears this out.[234]

The reason this mistake may have happened is that Augustine's knowledge of Greek was at an elementary level. When he was beginning his commentary on Genesis in 401 A.D., his abilities in Greek were poor.[235] It wasn't until Augustine was an old man that he had a modest reading ability of Greek. Unfortunately, Augustine was limited to the Vulgate's translation of Sirach 18:1, and thus he misinterpreted the meaning of the verse. Hence, his "proof text" cannot hold the weight Augustine put on it.[236]

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[232] *Literal Meaning of Genesis*, Bk 4, Ch 33, No 52.

[233] The Douay-Rheims, which translates the Latin Vulgate, reads: "He that liveth for ever created all things together."

[234] "He who lives for ever created the whole universe; the Lord alone will be declared righteous...To none has he given power to proclaim his works; and who can search out his mighty deeds? Who can measure his majestic power? And who can fully recount his mercies? It is not possible to diminish or increase them, nor is it possible to trace the wonders of the Lord" (Sirach 18:1-6, RSV).

[235] *Ancient Christian Writers*, ed. Johannes Questen, et al, Vol. 1, New York: Newman Press, 1982, p. 5.

[236] Another possibility for the Vulgate's choice of *simul* for κοινός is that there is a slight semantic overlap between the two words. This usually happens when time and material things are inadvertently interchanged. For example, although *simul's* common meaning focuses on time (and thus it is usually translated as "at the same time" or "simultaneous"), it could also be confused with the idea of physical

But Augustine has yet another proof text that he feels is his strongest argument. Referring to Genesis 2:4-9 he writes:

> Since by the terms “heaven” and “earth” the sacred writer...wished us to understand here the whole of creation, we might ask why he added, ‘and every green thing of the field’? I

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solidarity. If, for example, the people of a city stand together against an opposing army, it could be said that the people are both: (a) standing together, at the same time, against the army, and (b) standing together in solidarity against the army. Hence, the entire citizenry’s simultaneous standing against the enemy will overlap in meaning with their common solidarity as one united group against the enemy. Naturally, if all the citizens did not stand together simultaneously against the enemy, it could not be said that they were “all together” in their opposition against the enemy. Barring such an example of semantic overlap, time is normally understood as a separate entity from space. Indeed, the normal meaning of “simul” deals with time, not commonality. The Latin Vulgate demonstrates that κοινός’ normal meaning is “in common,” since out of 59 uses of κοινός and its derivatives, only three are translated “simul” by the Vulgate (Sirach 18:1; Sirach 50:17; and Susanna 1:14), and in those three instances, it is due precisely to the semantic “overlap” described above. An examination of the other two instances besides Sirach 18:1 will illustrate this crucial point. The Catholic Revised Standard Version of Sirach 50:17 reads: “Then all the people together (koine/simul) made haste and fell to the ground upon their faces.” This verse offers a perfect illustration of the semantic overlap between “simul” and “koine.” The people “all made haste” (physically and spatially, as one, "common" physical grouping, "all together"). But they also necessarily made haste “at once,” that is, “at one time.” It is important to note, however, that when the people “fell to the ground,” they did not fall at the same precise instant. Like the members of any crowd acting on a common impulse, the members of this crowd fell to the ground at more or less the same time. In a similar sense the creation of all things took place “at once” – with relative simultaneity – but not “at the same precise instant.” Susanna 1:14 illustrates the same phenomenon. The Catholic Revised Standard Version reads: “And then together (simul/koine) they arranged for a time when they could find her alone.” Here two men, as one physical group, jointly, “in common” (“all together”), arranged something. But they also arranged something “at the same time.” In light of these examples one could say that *simul* in Sirach 18:1 was not so much a mistranslation of κοινός as it was a translation susceptible to misinterpretation through a narrowing of the semantic field. In light of the two other places in the Vulgate where κοινός is translated as *simul*, it is logical to conclude that *simul* in Sirach 18:1 was also meant to join together the two meanings of physical entirety and temporal simultaneity. For an Old Testament author (or translator) who believed in the six days of creation, this is hardly surprising, since God did create the universe in its entirety and at one time, the hexameron.

> believe that he put the matter in this way in order to emphasize what day he spoke of when he said, 'When day was made...But when we recall the order in which creatures were made, we find that all the grass of the field was created on the third day, before the sun was made (for it was made on the fourth day)...When, therefore, we hear, 'When day was made, God made heaven and earth, and all the grass of the field,' we are admonished to think of that day which may perhaps be a corporeal thing consisting in some sort of light unknown to us, or a spiritual thing made up of the united company of angels.[237]

He concludes:

> Now perhaps we have here a confirmation of what we tried to show in the previous book, that God created everything at one time. The earlier narrative [Genesis 1] stated that all things were created and finished on six successive days, but now [Genesis 2] to one day everything is assigned, under the terms "heaven" and "earth," with the addition also of "plants." If, therefore, as I have already said, "day" were understood in its ordinary sense, the reader would be corrected when he recalled that God had ordered the earth to produce the green things of the field before the establishment of that day that is marked by the sun. Hence, I do not now appeal to another book of Holy Scripture to prove that God created all things together [Sirach 18:1]. But the very next page following the first narrative of creation testifies to this when it tell us, 'When day was made, God made heaven and earth and every green thing of the field. Hence you must understand that this day was seven times repeated, to make up the seven days.[238]

Here again, however, not knowing any of the Hebrew language, Augustine makes conclusions that are simply not supported by the original text.[239] The specific phrasing of Gn 2:4 "***in*** the day," from the Hebrew

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[237] *Literal Meaning of Genesis*, Bk 5, Ch 2, No. 4.

[238] *Literal Meaning of Genesis*, Bk 5, Ch 3, No 6.

[239] In answering an Objection, neither does Aquinas seem to catch the difference between the Greek and Latin, but still manages to give an adequate answer by making a distinction in the word *creation*: "Objection 2: Further, it is said (Ecclesasticus 18:1): "He that liveth for ever, created all things together." But this would not be the case if the days of these works were more than one. Therefore they are not many but one only. Reply to Objection 2: God created all things

ביום *beyom*, creates a Hebrew idiom meaning “when God made,” and thus, on strict grammatical grounds, this would disallow Gn 2:4’s “day” from disqualifying Gn 1:5’s “day” from being a twenty-four-hour day.

In addition, whenever the Hebrew *yom* (“day”) is used with an ordinal number in Scripture, it never refers to an indefinite or long period of time. In Genesis 1, there are six ordinal numbers enumerated: “the first day...the second day...the third day...” and so on until the sixth day. In contrast, Gn 2:4’s “day” does not have an ordinal number attached to it, which would eliminate it from comparison to Genesis 1.

Further, Augustine’s objection can be answered by focusing on the particular words used in Genesis 2 that are not used in Genesis 1. Gn 2:5 refers to the “shrub” (שׂיח) of the field, but this word does not appear in Gn 1:11-12 or 1:29-30.[240] Rather, Gn 1:11-12 refers to the “herb” (עשׂב)[241] and the “tree producing fruit” (עשׂה פּרי).[242] Hence, the first distinction between Gn 1:11-12 and Gn 2:5 is that the former indicates only two kinds of vegetation, whereas Gn 2:5 adds a third. Apparently, the two plants of Gn 1:11-12 served as food for Adam and Eve described in Gn 1:29-30.

Secondly, Gn 2:5 specifies that “not ***every*** herb of the field had yet sprung up,” which would mean there were some that had sprung up on the third day of creation, and some which sprung up on or after the sixth day of creation.

Thirdly, Gn 2:5 says the “shrubs” and “herbs” had not yet “sprung up” or “produced” (יצמח) which contrasts with the “growth” (דשׁא) of Gn 1:11-12. The word יצמח (*tsemach*) refers to a budding for the next generation,[243] while דשׁא (*dashah*) refers to an original sprouting of the first generation of fruits. Hence, Adam and Eve’s food, on the first day of their creation, was the original fruit of the two plants in Gn 1:11-12, while the “shrubs” and the budding plants of Gn 2:5 would have to wait until the appropriate time for growth.

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together so far as regards their substance in some measure formless. But He did not create all things together, so far as regards that formation of things which lies in distinction and adornment. Hence the word creation is significant” (*Summa Theologica*, Bk 1, Ques. 74, Art 2).

[240] שׂיח (siach) is used four times in the OT to refer to some type of plant (*cf.* Gn 2:5; 21:15; Jb 30:4, 7), yet a plant that does not produce fruit, but some other kind of edible product, *e.g.*, vines.

[241] עשׂב (eseb) appears in also in Gn 2:5; 3:18; 9:3; Ex 9:22,25; Dt 11:15, et al. This may refer to plants that produced grains, such as wheat, corn, etc.

[242] פּרי (peri) is used also in Gn 1:29; 30:2; Ex 10:15; Lv 23:40; et al.

[243] This meaning can be seen, for example, in Jb 38:27; Ps 85:12; 104:14; *cf.* Gn 41:6; Ex 10:5; Lv 13:37; Dt 29:22; Jg 16:22; 2Sm 10:5; Ps 132:17, et al.

All in all, the reason we can levy these critiques on Augustine's view of Genesis is that he invited such criticism himself. In *The Literal Meaning of Genesis* he writes:

> Whoever, then, does not accept the meaning that my limited powers have been able to discover of conjecture but seeks in the enumeration of the days of creation a different meaning, which might be understood not in a prophetical or figurative sense, but literally and more aptly, in interpreting the works of creation, let him search and find a solution with God's help. I myself may possibly discover some other meaning more in harmony with the words of Scripture. I certainly do not advance the interpretation given above in such a way as to imply that no better one can ever be found, although I do maintain that Sacred Scripture does not tell us that God rested after feeling weariness and fatigue.[244]

In *The City of God*, he is a bit more cautious about his view:

> But simultaneously with time the world was made, if in the world's creation change and motion were created, as seems evident from the order of the first six or seven days. For in these days the morning and evening are counted, until, on the sixth day, all things which God then made were finished, and on the seventh the rest of God was mysteriously and sublimely signalized. What kind of days these were it is extremely difficult, or perhaps impossible for us to conceive, and how much more to say![245]

At many points we find Augustine still vacillating between the literal and spiritual interpretation. For example, regarding the light of the first day he writes in *The City of God*:

> And first of all, indeed, light was made by the word of God, and God, we read, separated it from the darkness, and called the light Day, and the darkness Night; but what kind of light that was, and by what periodic movement it made evening and morning, is beyond the reach of our senses; neither can we understand how it was, and yet must unhesitatingly believe it. For either it was some material light, whether proceeding from the upper parts of

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[244] Bk 4, Ch 28, No 45.

[245] *City of God*, Bk XI, Ch 6.

> the world, far removed from our sight, or from the spot where the sun was afterwards kindled; or under the name of light the holy city was signified, composed of holy angels and blessed spirits, the city of which the apostle says, 'Jerusalem which is above is our eternal mother in heaven.'[246]

At times Augustine seems far from his spiritual interpretation, as it seems here in the *Confessions* (400 AD), written a year before *The Literal Meaning of Genesis*:

> For very wonderful is this corporeal heaven, of which firmament, between water and water, the second day after the creation of light, Thou saidst, Let it be made, and it was made. Which firmament Thou calledst heaven, that is, the heaven of this earth and sea, which Thou madest on the third day, by giving a visible shape to the formless matter which Thou madest before all days.[247]

In other works, Augustine applies his spiritual interpretation in other directions:

> In the creation God finished His works in six days, and rested on the seventh. The history of the world contains six periods marked by the dealings of God with men. The first period is from Adam to Noah; the second, from Noah to Abraham; the third, from Abraham to David; the fourth, from David to the captivity in Babylon; the fifth, from the captivity to the advent of lowliness of our Lord Jesus Christ; the sixth is now in progress, and will end in the coming of the exalted Savior to judgment. What answers to the seventh day is the rest of the saints, not in this life, but in another.[248]

While we do not have a statement from Augustine that he viewed the days of Genesis as twenty-four-hour periods, Augustine does stipulate that he believes the days of the Flood to be twenty-four hour days:

> It is plain that the day then was what it now is, a space of four-and-twenty hours, determined by the lapse of day and night; the

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[246] *City of God*, Bk XI, Ch 7.

[247] *Confessions*, Bk XII, Ch 8.

[248] *Contra Faustus*, 400 AD, Bk XII, 8.

> month then equal to the month now, which is defined by the rise and completion of one moon; the year then equal to the year now, which is completed by twelve lunar months, with the addition of five days and a fourth to adjust it with the course of the sun. It was a year of this length which was reckoned the six hundredth of Noah's life, and in the second month, the twenty-seventh day of the month, the flood began, a flood which, as is recorded, was caused by heavy rains continuing for forty days, which days had not only two hours and a little more, but four, and-twenty hours, completing a night and a day. And consequently those antediluvians lived more than 900 years, which were years as long as those which afterwards Abraham lived 175 of, and after him his son Isaac 180, and his son Jacob nearly 150, and some time after, Moses 120, and men now seventy or eighty, or not much longer, of which years it is said, "their strength is labor and sorrow.[249]

All in all, as regards evolutionary theory, Augustine cannot come to its aid. For whether the Creation was created in Augustine's "one day," or over six twenty-four-hour days, the fact remains that Augustine believed all of creation came from nothing and occurred instantaneously, in a single moment, not over a long period of time. If anything, Augustine's "day" is infinitesimally less than twenty-four hours, not infinitesimally more.

The Medieval Theologians

Aquinas: "It is necessary to say that God brings things into being from nothing...(ST, I, Q 45, a 2, ad 2); Creation does not mean the building up of a composite thing from pre-existing principles but it means that the composite is created so that it is brought into being at the same time with all its principles.[250]

Aquinas: Reply to Objection #7: "The words 'one day' are used when day is first instituted, to denote that one day is made up of twenty-four hours. Hence, by mentioning 'one,' the measure of one natural day is fixed. Another reason may be to signify that a day is completed by the return of the sun to the point from which it commenced its course. And yet another, because at the completion of a week of seven days, the first day returns which is one with the eighth day. The three reasons assigned above are those given by Basil [Homily 2 in *Hexameron*].[251]

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[249] *City of God*, Bk 15, Ch 14. As some of the other Fathers believed, Augustine also held that the world in his day was less than 6,000 years old: "...according to Scripture, less than 6000 years have elapsed since He began to be..."(*City of God*, Bk 12, Ch 12).

[250] *Summa Theologica*, I, Q 45, a 4, ad 2.

Aquinas: Reply to Objection #5: "According to Augustine (*De Genesi Contra Manichaeos*), primary matter is meant by the word earth, where first mentioned, but in the present passage it is to be taken for the element itself. Again it may be said with Basil (*Homily 4 in Hexaemeron*), that the earth is mentioned in the first passage in respect of its nature, but here in respect of its principal property, namely, dryness. Wherefore it is written: "He called the dry land, Earth." It may also be said with Rabbi Moses, that the expression, "He called," denotes throughout an equivocal use of the name imposed. Thus we find it said at first "He called the light Day": for the reason that later on **a** period of twenty-four hours is also called day, where it is said "there was evening and morning, one day."[252]

> But it [the cosmos] was not made from something; otherwise the matter of the world would have preceded the world...Therefore, it must be said that the world was made from nothing.[253]

As for the issue of the majority of Fathers having a different view of the Creation days than Augustine, Aquinas tries to find a middle road, but appears to end up siding with the former due to the need to explain how the substance obtained its different forms. He explains that the different forms could only come about on successive days:

Aquinas: "On the contrary, It is written (Genesis 1), 'The evening and the morning were the second day…the third day,' and so on. But where there is a second and third there is more than one. There was not, therefore, only one day. I answer that, on this question Augustine differs from other expositors. His opinion is that all the days that are called seven, are one day represented in a sevenfold aspect (*De Genesi ad literam* iv, 22; *De Civitate* Dei xi, 9; *Ad Orosium* xxvi); while others consider there were seven distinct days, not one only. Now, these two opinions, taken as explaining the literal text of Genesis, are certainly widely different. For Augustine understands by the word day, the knowledge in the mind of the angels, and hence, according to him, the first day denotes their knowledge of the first of the Divine works, the second day their knowledge of the second work, and similarly with the rest. Thus, then, each work is said to have been wrought in some one of these days, inasmuch as God wrought in some one of these days, inasmuch as God wrought nothing in the universe without impressing the knowledge thereof on the angelic mind; which can know many things at the same time, especially in the Word, in Whom all angelic knowledge is perfected and terminated. So the distinction of days denotes the natural order of the things known, and not a succession in the knowledge acquired, or in the things produced. Moreover, angelic knowledge is appropriately called day, since light, the cause of day, is to be found in spiritual things, as Augustine observes *(De Genesi ad literam* iv, 28). In the opinion of the others, however, the days signify a succession both in time, and in the things produced.

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[251] *Summa Theologica*, Bk 1, Question 74, Art 3. Objection #7: "Further, 'first,' not 'one,' corresponds to 'second' and 'third.' It should therefore have been said that, 'The evening and the morning were the first day,' rather than 'one day.'"
[252] *Summa Theologica*, Bk 1, Ques. 69, Art 1Objection #5: "Further, the earth is given its name at its first creation by the words, "In the beginning God created heaven and earth." Therefore the imposition of its name on the third day seems to be recorded without necessity."
[253] *Ibid*., *Summa Theologica*, Q. 46, art. 2, 248-249.

If, however, these two explanations are looked at as referring to the mode of production, they will be found not greatly to differ, if the diversity of opinion existing on two points, as already shown (Q67, A1; Q69, A1), between Augustine and other writers is taken into account. First, because Augustine takes the earth and the water as first created, to signify matter totally without form; but the making of the firmament, the gathering of the waters, and the appearing of dry land, to denote the impression of forms upon corporeal matter. But other holy writers take the earth and the water, as first created, to signify the elements of the universe themselves existing under the proper forms, and the works that follow to mean some sort of distinction in bodies previously existing, as also has been shown (Q67, A1, 4; Q69, A1). Secondly, some writers hold that plants and animals were produced actually in the work of the six days; Augustine, that they were produced potentially. Now the opinion of Augustine, that the works of the six days were simultaneous, is consistent with either view of the mode of production. For the other writers agree with him that in the first production of things matter existed under the substantial form of the elements, and agree with him also that in the first instituting of the world animals and plants did not exist actually. There remains, however, a difference as to four points; since, according to the latter, there was a time, after the production of creatures, in which light did not exist, the firmament had not been formed, and the earth was still covered by the waters, nor had the heavenly bodies been formed, which is the fourth difference; which are not consistent with Augustine's explanation. In order, therefore, to be impartial, we must meet the arguments of either side.

Reply to Objection 1: On the day on which God created the heaven and the earth, He created also every plant of the field, not, indeed, actually, but "before it sprung up in the earth," that is, potentially. And this work Augustine ascribes to the third day, but other writers to the first instituting of the world.

Reply to Objection 2: God created all things together so far as regards their substance in some measure formless. But He did not create all things together, so far as regards that formation of things which lies in distinction and adornment. Hence the word creation is significant.

Reply to Objection 3: On the seventh day God ceased from making new things, but not from providing for their increase, and to this latter work it belongs that the first day is succeeded by other days.

Reply to Objection 4: All things were not distinguished and adorned together, not from a want of power on God's part, as requiring time in which to work, but that due order might be observed in the instituting of the world. Hence it was fitting that different days should be assigned to the different states of the world, as each succeeding work added to the world a fresh state of perfection.

Reply to Objection 5: According to Augustine, the order of days refers to the natural order of the works attributed to the days.[254]

Alcuin (735-804): Known as the greatest scholar of his age, taught in Charlemagne's Court school. He wrote nine Scriptural commentaries and revised the Latin Vulgate. He was a firm believer in a literal six-day *ex nihilo* creation. He wrote: "God created out of nothing the heaven, the earth, the angels, light, air, water and the soul of man."[255]

Rabanus Maurus Magnentius (776-856): student of Alcuin, Abbot of Fulda and Archbishop of Mainz. Highly regarded for his Scriptural and patristic knowledge. Most of his works are exegetical; his commentaries include almost the entire book of the Old and New Testament. He was a firm believer in a literal six-day creation, descriptions of which can be found in *Commentariorum in Genesin libri quatror*, PL 107, col. 449f.

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[254] *Summa Theologica*, Bk 1, Ques. 74, Art. 2.

[255] *Interrogationes et responsiones in Genesin*, PL 107, cols 519-521.

Peter Lombard (c. 1100-1160): Lombard, along with many of his contemporaries, held to an *ex nihilo* creation; the special creation of Adam and Eve, and that “the Catholic faith believes that there was one principle, one cause of all things, namely God.” Moreover, Lombard affirmed the “essentially hexameral plan” of creation, holding that God: “creates the angels and the unformed matter *simul* and *ex nihilo*. Then, in the work of six days, he produces individual creatures out of the unformed matter.... The days referred to in Genesis are to be understood literally as lasting twenty-four hours.”[256] He writes: “Moses says that the world was made by God as a creator, and he avoided the error of certain men who supposed that many first principles existed without a first principle.”[257]

Thierry of Chartres (d. 1150): The famous teacher at Paris and Chartres whose *Heptateuchon* is one of the chief sources of our knowledge regarding studies in the first half of the twelfth century. He utilized the first translations of Arabic sources in astronomy and mathematics. He was a firm believer in an *ex nihilo*, six-day creation.

Peter Abelard (1079-1142): One of the greatest intellectuals of the entire Middle Ages who studied under the School of Chartres and later under Anselm of Laon. He believed in an *ex nihilo*, six-day creation.[258]

Hugh of St. Victor (1096-1141): According to Adolf Harnack, he was one of “the most influential theologians of the twelfth century.” A great admirer of Augustine, and although steeped in Platonism, allegorical thought and mysticism, he maintained a belief in a literal six-day creation.[259]

Nicholas of Lyra (1270-1340): Professor at the Sorbonne, famous for his meticulous and literal exegesis; decrying the mystical interpretations of some of his predecessors; believed in a literal six-day creation in Genesis 1. Nicholas, although siding with Augustine’s literal interpretations, rejected the same’s allegorical interpretations of Genesis 1.

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[256] Marcia Colish, *Peter Lombard*, Leyden: E. J. Brill, 1994, vol. 1, 330-331; 337, 340-341.

[257] *Opera omnia,* vol. 2, PL 192, col 676.

[258] PL 178, cols. 738-745; 784.

[259] PL 167, col. 191.

Denis the Carthusian (d. 1471): the famed *Doctor Ecstaticus*, wrote in his *Enarratio in Genesim*: "Everything was created in six days in which a threefold work is illustrated, that is, creation, distinction, and ornamentation."

St. Lorenzo of Brindisi (1559-1619): a true child prodigy, it was said that Lorenzo knew the entire original text of the Bible, Hebrew and Greek, which was understood to be of supernatural origin. His beatification included the words: "Vere inter sanctos Ecclesiae doctores adnumerari potest" (Truly among holy church doctors he numbers with the mighty). He celebrated Mass often in ecstasies. He wrote commentaries only on Genesis and Ezekiel. Of Genesis 1, which he believed was a literal six-day creation, he wrote: "I have found Moses worthy of respect above all in what relates to his cosmopeia or cosmogenesis."

The Consensus of Church Fathers and Medieval Theologians

On The Firmament of Genesis 1:6-9

The Fathers and Middle Age theologians also struggled to understand the firmament. **Augustine**, for example, seeking a scientific answer to the firmament, writes:

> Now we are seeking to know whether the Creator, who has ordered all things in measure, and number, and weight, has assigned to the waters not just one proper place around the earth, but another also above the heavens, a region which has been spread around and established beyond the limits of air.
> What is the firmament? Is it that heaven which extends beyond the entire realm of air and above the air's farthest heights, where the lights and the stars are set on the fourth day? Or is the air itself called the firmament? This is the question that must concern us here.[260]

After offering his suggestions as to the nature of the firmament, he resolutely concluded:

> With this reasoning some of our scholars attack the position of those who refuse to believe that there are waters above the heavens while maintaining that the star whose path is in the

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[260] *Confessions*, Bk 2, Ch 1-2.

> height of the heaves is cold. Thus they would compel the disbeliever to admit that water is there not in a vaporous state but in the form of ice. But whatever the nature of that water and whatever the manner of its being there, we must not doubt that it does exist in that place. The authority of Scripture in this matter is greater that all human ingenuity.[261]

Apparently, Augustine did not hold to the "water canopy" theory, since he says that the water above the heavens "does exist," not "did exist," showing he believed they still occupied the same location in space in the fifth century AD when he was writing the above paragraph. Augustine is more detailed in the following quote: "...for on it the firmament was made between the waters above and beneath, and was called "Heaven," in which firmament the stars were made on the fourth day."[262]

> For very wonderful is this corporeal heaven, of which firmament, between water and water, the second day after the creation of light, you said, Let it be made, and it was made. Which firmament you called heaven, that is, the heaven of this earth and sea, which Thou made on the third day, by giving a visible shape to the formless matter which you made before all days.[263]

Thomas Aquinas, agreeing with Augustine that the present existence of the firmament could not be doubted due to the authority of Scripture, uses a similar argument in one of his *Replies to Objections*, citing Basil as the source of the idea. He writes:

> Reply to Objection 2: The solution is clear from what has been said, according to the last two opinions. But according to the first opinion, Basil gives two replies (Hom. 3 in *Hexaemeron*). He answers first, that a body seen as concave beneath need not necessarily be rounded, or convex, above. Secondly, that the waters above the firmament are not fluid, but exist outside it in a solid state, as a mass of ice, and that this is the crystalline heaven of some writers.

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[261] *The Literal Meaning of Genesis*, Bk 2, Ch. 5, No 9.

[262] *City of God*, Bk XI, Ch 9.

[263] *Confessions*, Bk XII, Ch 8.

> Reply Objection 3: According to the third opinion given, the waters above the firmament have been raised in the form of vapors, and serve to give rain to the earth. But according to the second opinion, they are above the heaven that is wholly transparent and starless. This, according to some, is the primary mobile, the cause of the daily revolution of the entire heaven, whereby the continuance of generation is secured. In the same way the starry heaven, by the zodiacal movement, is the cause whereby different bodies are generated or corrupted, through the rising and setting of the stars, and their various influences. But according to the first opinion these waters are set there to temper the heat of the celestial bodies, as Basil supposes (Hom. 3 in *Hexaemeron*). And Augustine says (*De Genesi ad literam* ii, 5) that some have considered this to be proved by the extreme cold of Saturn owing to its nearness to the waters that are above the firmament.[264]

Various Fathers and medieval theologians offered other opinions on the firmament.

Ambrose: "These are the heavens which declare the glory of God, these are His handiwork which the firmament proclaims. For not worldly enticements, but the grace of the divine working, raised them to the firmament of the most sacred Passion, and long before by the testimony of their character and virtues bore witness of them, that they continued steadfast against the dangers of this world."[265]

Aphrahat: From these things be thou persuaded that this earth, in which the children of Adam are sown, and the firmament that is over men, (even) that firmament which is set to divide the upper heavens from the earth and this life, shall pass away, and wear out, and be destroyed. And God will make a new thing for the children of Adam, and they shall inherit inheritances in the Kingdom of Heaven.[266]

Archelaus: "Then the living Spirit created the world; and bearing in himself three other powers, he came down and brought off the princes, and settled them in the firmament, which is their body, (though it is called) the sphere. Then, again, the living Spirit created the luminaries, which are fragments of the soul, and he made them thus to move round and round the firmament..."[267]

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[264] *Summa Theologica*, Bk 1, Ques. 68. Art 2.

[265] Letter XXII. Ambrose held that the firmament was solid, sustained by God's power. See *Saint Ambrose: Hexameron, Paradise, and Cain and Abel*, trans. J. J. Savage (Wash, DC: Catholic University, 1961), pp. 11-16.

[266] *The Demonstrations*, 24.

Athanasius: "And all the visible creation was made in six days: in the first, the light which He called day; in the second the firmament; in the third, gathering together the waters....And God set them in the firmament of the heaven, to give light upon the earth, and to rule over the day and over the night....And the firmament is to divide between waters and waters, and to be a place to set the stars in."[268]

Basil: "For the deep is nothing else than a huge quantity of water whose limit man cannot comprehend. In the beginning, indeed, the water lay all over the surface of the earth. And first God created the firmament to divide the water above the firmament from the water below the firmament. For in the midst of the sea of waters the firmament was established at the Master's decree. And out of it God bade the firmament arise, and it arose. Now for what reason was it that God placed water above the firmament? It was because of the intense burning heat of the sun and ether. For immediately under the firmament is spread out the ether, and the sun and moon and stars are in the firmament, and so if water had not been put above it the firmament would have been consumed by the heat."[269]

Basil: "'And God called the firmament heaven.' The nature of light belongs to another, and the firmament only shares it on account of its resemblance to heaven. We often find the visible region called heaven, on account of the density and continuity of the air within our ken, and deriving its name 'heaven' from the word which means to see. It is of it that Scripture says, 'The fowl of the air,' 'Fowl that may fly...in the open firmament of heaven'"[270]

Basil: "Now we must say something about the nature of the firmament, and why it received the order to hold the middle place between the waters. Scripture constantly makes use of the word 'firmament' to express extraordinary strength. 'The Lord in firmament and refuge'; 'I have strengthened the pillars of it'; 'Praise him in the firmament of his power.' The heathen writers thus call a strong body one which is compact and full, to distinguish it from the mathematical body. A mathematical body is a body which exists only in the three dimensions, breadths depth, and height. A firm body, on the contrary, adds resistance to the dimensions. It is the custom of Scripture to call firmament all that is strong and unyielding. It even uses the word to denote the condensation of the air: He, it says, who strengthens the thunder. Scripture means by the strengthening of the thunder, the strength and resistance of the wind, which, enclosed in the hollows of the clouds, produces the noise of thunder when it breaks through with violence. Here then, according to me, is a firm substance, capable of retaining the fluid and unstable element water; and as, according to the common acceptation, it appears that the firmament owes its origin to water, we must not believe that it resembles frozen water or any other matter produced by the filtration of water; as, for example, rock crystal, which is said to owe its metamorphosis to excessive congelation, or the transparent stone which forms in mines. This pellucid stone, if one finds it in its natural perfection, without cracks inside, or the least spot of corruption, almost rivals the air in clearness. We cannot compare the firmament to one of these substances. To hold such an opinion about celestial bodies would be childish and foolish; and although everything may be in everything, fire in earth, air in water, and of the other elements the one in the other; although none of those which come under our senses are pure and without mixture, either with the element which serves as a medium for it, or with that which is contrary to it; I, nevertheless, dare not affirm that the firmament was formed of one of these simple substances, or of a mixture of them, for I am taught by Scripture not to allow my imagination to wander too far a field. But do not let us forget to remark that, after these divine words 'let there be a firmament,' it is not said 'and the firmament was reader' but, 'and God made the firmament, and divided the waters.' Hear, O ye deaf! See, O ye blind! Who, then, is deaf? He who does not hear this startling voice of the Holy Spirit. Who is blind? He who does not see such clear proofs of the Only begotten. 'Let there be a firmament.' It is the voice of the primary and principal Cause. 'And God made the firmament.' Here is a witness to the active and creative power of God.[271]

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[267] *Disputation with the Heresiarch Manes*, 6.

[268] *Discourse Against the Arians*, No. 2, Ch 16; 17.

[269] *Exposition of the Orthodox Faith*, Bk 2, Ch 9.

[270] *Homilies*, 3. Cited also by Aquinas.

Basil: "'In the firmament of heaven,' that is to say, as we have said before, in that part of the air called *ouranos* [Greek] heaven, from the word *oran*, which means to see; called firmament, because the air which extends over our heads, compared to the aether, has greater density, and is thickened by the vapors which exhale from the earth."[272]

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[271] *Ibid.*

Basil: "Therefore we read: 'Let there be a firmament in the midst of the waters, and let it divide life waters from the waters.' I have said what the word firmament in Scripture means. It is not in reality a firm and solid substance which has weight and resistance; this name would otherwise have better suited the earth. But, as the substance of superincumbent bodies is light, without consistency, and cannot be grasped by any one of our senses, it is in comparison with these pure and imperceptible substances that the firmament has received its name."[273]

Basil: "For although, as Moses teaches, each act of creation had its proper order; the making the firmament solid, the laying bare of the dry land, the gathering together of the sea, the ordering of the stars..."[274]

Clement of Rome: "as also He decked the visible firmament with stars, to which also He assigned their paths and arranged their courses."[275]
"And now the water which was within the world, in the middle space of that first heaven and earth, congealed as if with frost, and solid as crystal, is distended, and the middle spaces of the heaven and earth are separated as by a firmament of this sort; and that firmament the Creator called heaven, so called by the name of that previously made: and so He divided into two portions that fabric of the universe, although it was but one house."[276]

Cyril of Jerusalem: "For God said, Let there be a firmament in the midst of the water. God spake once for all, and it stands fast, and falls not. The heaven is water, and the orbs therein, sun, moon, and stars are of fire: and how do the orbs of fire run their course in the water? But if any one disputes this because of the opposite natures of fire and water, let him remember the fire which in the time of Moses in Egypt flamed amid the hail, and observe the all-wise workmanship of God."[277]

Ephraim the Syrian: "Let the second day, sing praise to the Birth of the second Son, and His voice which first commanded the firmament and it was made, divided the waters that were above, and gathered the seas that were under."[278]

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[272] *Homilies*, 8.
[273] *Homilies*, 7.
[274] *On the Trinity*, Bk XII.
[275] *Homilies*, III, Ch XXXIII.
[276] *Recognitions of Clement*, Bk 1, Ch XXVII.
[277] *Catechetical Lectures*, 9, 5.

Gregory of Nyssa: "So likewise, in the case of heaven and the firmament, though one nature is signified by each of these words, their difference represents one or other of its peculiar characteristics, in looking at which we learn one thing by the appellation "heaven," and another by 'firmament.' For when speech would define the limit of sensible creation, beyond which it is succeeded by the transmundane void apprehended by the mind alone, in contrast with the intangible and incorporeal and invisible, the beginning and the end of all material subsistences is called the firmament. And when we survey the environment of terrestrial things, we call that which encompasses all material nature, and which forms the boundary of all things visible, by the name of heaven."[279]

Hilary of Poitiers: "For although, as Moses teaches, each act of creation had its proper order; the making the firmament solid."[280]

Hippolytus: "For there has been a separation made between water and water; and there is water, that below the firmament of the wicked creation, in which earthly and animal men are washed; and there is life-giving water, (that) above the firmament, of the Good One, in which spiritual (and) living men are washed; and in this Elohim washed Himself."[281]

Hippolytus: "But that the circle of the sun is twenty-seven times larger than the moon, and that the sun is situated in the highest (quarter of the firmament); whereas the orbs of the fixed stars in the lowest."[282]

Commentary: Some object that Hippolytus is wrong on his facts. But whether the sun's orbit is twenty-seven times larger than the moon; or whether the sun's orbit is closer to Earth than the stars, is not at issue. Even today's modern astronomy has no certitude on how big the universe is, and the estimates of it are changing very often. The point of this exercise is to recognize that that, despite the errors in distance, the Fathers and the Church were in consensus that the Earth was motionless and that the sun, moon and stars revolved around it.

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[278] *Hymns*, 19.

[279] *Answer to Eunomius' Second Book.*

[280] *On the Trinity*, Bk XII.

[281] *Refutation of All Heresies*, Bk V, Ch 22.

[282] *Ibid.*

Hippolytus: "...and that the stars, coursing (the firmament) as shooting sparks, arise out of the motion of the pole."[283]

Hippolytus: "The first and only (one God), both Creator and Lord of all, had nothing coequal with Himself; not infinite chaos, nor measureless water, nor solid earth, nor dense air, not warm fire, nor refined spirit, nor the azure canopy of the stupendous firmament."[284]

Irenaeus: "For as the heaven which is above us, the firmament, the sun, the moon, the rest of the stars, and all their grandeur, although they had no previous existence, were called into being."[285]

Jerome: "Must not every one reject and despise such special pleading as that by which Origen says of the waters that are above the firmament that they are not waters, but heroic beings of angelic power, and again of the waters that are over the earth--that is, below the firmament that they are potencies of the contrary sort, that is, demons?"[286]

Jerome: "'...the righteous shall shine as the stars; and the wise, that is the learned, as the firmament.' You can see, therefore, how great is the difference between righteous ignorance and instructed righteousness. Those who have the first are compared with the stars, those who have the second with the heavens. Yet, according to the exact sense of the Hebrew, both statements may be understood of the learned, for it is to be read in this way: "They that be wise shall shine as the brightness of the firmament; and they that turn many to righteousness as the stars forever and ever."[287]

Jerome: "A firmament is constructed between heaven and earth, and to this is allotted the name heaven, in the Hebrew *shamayim* or 'what comes out of the waters,' and the waters which are above the heavens are parted from the others to the praise of God. Wherefore also in the vision of the prophet Ezekiel there is seen above the cherubim a crystal stretched forth, that is, the compressed and denser waters. The first living beings come out of the waters; and believers soar out of the layer with wings to heaven. Man is formed out of clay and God holds the mystic waters in the hollow of his hand."[288]

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[283] *Ibid*., Ch. VII.

[284] *Ibid*., Ch XXVIII.

[285] *Against Heresies*, Bk II, Ch XXXIV.

[286] Letter LI, from Epiphanius.

[287] Letter LIII to Paulinus.

[288] Letter LXIX to Oceanus.

Jerome: "The sun has its own splendor, the moon tempers the darkness of the night; and the five heavenly bodies which are called planets traverse the sky in different tracks and with different degrees of luminousness. There are countless other stars whose movements we trace in the firmament. Each has its own brightness."[289]

John Damascene: "But further, God called the firmament also heaven, which He commanded to be in the midst of the waters, setting it to divide the waters that are above the firmament from the waters that are below the firmament. And its nature, according to the divine **Basilius** [Basil] who is versed in the mysteries of divine Scripture, is delicate as smoke. Others, however, hold that it is watery in nature, since it is set in the midst of the waters: others say it is composed of the four elements: and lastly, others speak of it as a fifth body, distinct from the four elements."[290]

John Damascene: "The heaven of heaven, then, is the first heaven which is above the firmament. So here we have two heavens, for God called the firmament also Heaven. And it is customary in the divine Scripture to speak of the air also as heavens, because we see it above us."[291]

John Damascene: "For in the midst of the sea of waters the firmament was established at the Master's decree. And out of it God bade the firmament arise, and it arose. Now for what reason was it that God placed water above the firmament? It was because of the intense burning heat of the sun and ether. For immediately under the firmament is spread out the ether, and the sun and moon and stars are in the firmament, and so if water had not been put above it the firmament would have been consumed by the heat."[292]

Justin Martyr: "And so also, of the heaven which was created, he thought that the heaven which was created and which he also called the firmament."[293]

Lactantius: "In that place he looked up to heaven, by which name we now call it, and that which was above the world which was called the firmament."[294]

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[289] *Against the Pelagians*, Bk 1, 16.
[290] *Exposition of the Orthodox Faith*, Bk II, Ch 6.
[291] *Ibid.*, Bk II, Ch. 6.
[292] *Ibid.*, Bk II, Ch 9.
[293] *To the Greeks*, Ch XXX.
[294] *Divine Institutes*, Bk I, Ch XI.

Novation: “Although it may be reared with immense piles of stones, the mountain crests are loftier; and although the fretted roofs glitter with gold, they will be surpassed by the brightness of the starry firmament.”[295]

Novation: “Nevertheless also, in higher regions; that is, above even the firmament itself, regions which are not now discernible by our eyes, He previously ordained angels, he arranged spiritual powers, He put in command thrones and powers, and founded many other infinite spaces of heavens, and unbounded works of His mysteries...a crystal covering being thrown over all things; that is, the heaven covering all things, which at the command of God had been consolidated into a firmament.”[296]

Origin: “The star that was seen in the east we consider to have been a new star, unlike any of the other well-known planetary bodies, either those in the firmament above or those among the lower orbs.”[297]

Origin: “Thus, for instance, there is the true light, and another heaven beyond the firmament, and a Sun of righteousness other than the sun we see.”[298]

Origin: “Now, when it is said that all things were made by Him, and that in Him were all things created, both things in heaven and things on earth, there can be no doubt that also those things which are in the firmament, which is called heaven, and in which those luminaries are said to be placed, are included amongst the number of heavenly things.”[299]

Rufinus: “I would first, with your leave, draw your attention to this firmament which our eyes behold, and ask you to explain, if you can, the nature of this visible luminary, how that celestial fire generates from itself the brightness of light.”[300]

Tertullian: “In like manner with respect to the heaven, it informs us first of its creation – ‘In the beginning God made the heaven:’ it then goes on to introduce its arrangement; how that God both separated ‘the water which was below the firmament from that which was above the firmament,’ and called the firmament heaven, – the very thing He had created in the beginning."[301]

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[295] *On the Public Shows*, 9.
[296] *On the Trinity*, Ch I; VIII
[297] *Against Celsus*, Preface, Ch LVIII.
[298] *Against Celsus*, Bk VII, Ch XXXI.
[299] *De Principiis*, Bk I, Ch VII.
[300] *Commentary on the Apostles’ Creed*, 4.

Theophilus: "And God made the firmament, and divided the waters which were under the firmament from the waters which were above the firmament. And God called the firmament Heaven....In the very beginning, therefore, of the history and genesis of the world, the holy Scripture spoke not concerning this firmament [which we see], but concerning another heaven, which is to us invisible, after which this heaven which we see has been called 'firmament,' and to which half the water was taken up that it might serve for rains, and showers, and dews to mankind. And half the water was left on earth for rivers, and fountains, and seas. "[302]

The Consensus of Church Fathers and Medieval Theologians

On a Spherical Earth

Because of certain phrases in the Bible (*e.g.*, "four corners of the earth") some maintain the Bible is following ancient Babylonian, Hindu, Egyptian and early Greek ideas of a flat earth surrounded by a dome, but that is not the case. In actuality, these fallacious ideas were the result of the lack of both divine revelation and scientific study. The biblical testimony and the Hebrews who interpreted it understood the Earth as spherical. As regards the other ancient peoples, not until the Greeks noticed in the 6th century B.C. that lunar eclipses caused circular shadows on the moon did they suspect the earth was spherical.

As for the Fathers of the Church, the following facts are evident:

- The Fathers of the Church knew of eclipses, how they were formed, and the implications for the shapes of the heavenly bodies.

Basil: "The eclipse of the moon, on the other hand, is due to the shadow the earth casts on it when it is a fifteen days' moon and the sun and moon happen to be at the opposite poles of the highest circle, the sun being under the earth and the moon above the earth. For the earth casts a shadow and the sun's light is prevented from illuminating the moon, and therefore it is then eclipsed."[303]

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[301] *Against Hermogenes*, Ch XXVI. Others, such as Rabanus Maurus, agreed with Basil that the water above the firmament could be in the form of ice and thus be a transparent crystalline substance (*Commentariorum in Genesin*, PL 107, 449). The great Jewish scholar, Moses Maimonides, held that the firmament referred to the sphere of the fixed stars, and that the sun rested within this sphere, adding that "there is no vacuum in the universe" (*The Guide for the Perplexed*, trans. M. Friedländer (NY: Dover, 1956), p. 214).

[302] *To Autolycus*, Bk II, Ch XI; XIII.

- The Fathers understood that the heavens were wrapped around the entire earth, calibrating it in increments of a sphere of 360 degrees.

Basil: "The circle of the zodiac has an oblique motion and is divided into twelve sections called zodia, or signs: each sign has three divisions of ten each, *i.e.* thirty divisions, and each division has sixty very minute subdivisions. The heaven, therefore, has three hundred and sixty-five [sic] degrees: the hemisphere above the earth and that below the earth each having one hundred and eighty degrees."[304]

Interestingly enough, there is not a lot of information in the Pentateuch about the shape of the Earth. Except for Job, which may have been written earlier, most of the information we have about the shape and substance of the Earth comes from the Psalms and Proverbs, while some comes from the prophets (Isaiah, Jeremiah, Micah), and a couple references in 1 Samuel. There is also a mention in Hebrews.

The Bible speaks about the "corners of the Earth,"[305] or "ends of the Earth."[306] The latter two terms do not, of course, mean that the Earth has literal corners or ends. Rather, "corners" refers to the four compass points (north, east, south and west), while "ends" refers to the respective east and west horizons. Hence, Scripture is not implying that the Earth is flat. Not only does Scripture imply that the Earth is a sphere,[307] it never refers to the Earth as being flat.

Jb 38:4 shows that the foundation of the Earth is a complicated structure with precise measurements that are unfathomable to Job. Jr 31:37 echoes this perspective as it says "the foundations cannot be discovered." We understand from this language that the "foundation of the earth" is its core, upon which everything else rests. It is a substance of extreme strength, as Mi 6:2 and Ps 104:5 indicate. Modern science has not been able to tell us the composition of the core of the earth, since everything from molten iron to rock has been proposed without resolution.

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[303] *Orthodox Faith*, Bk 2, Ch VII.

[304] *Orthodox Faith*, Bk 2, Ch VII.

[305] Jb 37:3; Is 11:12; 41:9; Ez 7:2; Ap 7:1; 20:8.

[306] Dt 28:64; 33:17; 1Sm 2:10; Jb 28:24; 38:13; Ps 19:4-6; 22:27; 46:9; 48:10; 59:13; 61:2; 65:5; 41:9; Jr 51:16; Dn 4:10-11; Mk 13:27.

[307] Jb 26:10; Pr 8:27-29; Is 40:22.

The Bible also speaks of the "the foundation of the earth,"[308] and the "pillars of the earth."[309] The latter would be the structures that rest on the foundation, which is more or less indicated in 1Sm 2:8. Some have assumed that the Bible is merely reiterating something akin to the ancient Hindu idea that earth is flat and rests upon a giant turtle. But no such notions are displayed in Scripture. Scripture maintains that the earth rests in space and is not supported by any material thing for it "hangs upon nothing" (Jb 26:7). This would mean that the "pillars" apply only to the interior of the Earth. The pillars rest between the core and the surface. Science knows this as the "mantle" of the earth. They also know that the mantle is made up of rock, much of it granite rock, which is one of the hardest structures known. They also know that these structures appear intermittently around the globe, and are always positioned vertically, one end facing the core and the other facing the surface of the Earth.[310] To recap, there is an inner core. Around the core is the mantle, which contains vertical pillars radiating from the top of the mantle to the surface of the Earth. Around the mantle, is the land surface of the Earth, but it is uneven. Between the uneven portions, water collects. If one were looking at this from a two-dimensional perspective, one could draw a circle (concentric with the core and the mantle) that would cut through the uneven land mass and the water mass, serving as a boundary for the land and water (Pr 8:27; Jb 26:10; Is 40:22).

- The Fathers were very definite that the Earth is a sphere.

Gregory of Nyssa: "As, when the sun shines above the earth, the shadow is spread over its lower part, because its spherical shape makes it impossible for it to be clasped all round at one and the same time by the rays, and necessarily, on whatever side the sun's rays may fall on some particular point of the globe, if we follow a straight diameter, we shall find shadow upon the opposite point, and so, continuously, at the opposite end of the direct line of the rays shadow moves round that globe, keeping pace with the sun, so that equally in their turn both the upper half and the under half of the earth are in light and darkness.[311]

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[308] 2Sm 22:16; Ps 18:15; 102:25; Pr 8:27-29; Is 48:13; Jn 17:24.

[309] 1Sm 2:8; Jb 9:6; 38:4-6.

[310] Dr. Robert Gentry has made studies on granite rocks that are near the surface and has found that they contain Polonium 218 halos. Since Polonium 218 has a half-life of 3 minutes, this means that the granite columns had to have been made instantaneously. Modern science has never produced granite in the laboratory. Its crystalline structure will not allow reproduction. (wwwhalos.com).

[311] *On the Soul and the Resurrection*.

Basil: "Further, some hold that the Earth is in the form of a sphere, others that it is in that of a cone. At all events it is much smaller than the heaven, and suspended almost like a point in its midst. And it will pass away and be changed. But blessed is the man who inherits the Earth promised to the meek."[312]

Basil: "These are lakes, and there is only one sea, as those affirm who have traveled round the Earth."[313]

Clement of Alexandria: "And how the Earth and sea their place should keep; And when the seasons, in their circling course, winter and summer, spring and autumn, each should come, according to well-ordered plan; out of a confused heap who didst create this ordered sphere, and from the shapeless mass."[314]

Augustine: "But they do no remark that, although it be supposed or scientifically demonstrated that the world is of a round and spherical form…"[315]

Augustine: "Ye have heard in the Psalm, 'I have seen the end of all perfection.' He hath said, I have seen the end of all perfection: what had he seen? Think we, had he ascended to the peak of some very high and pointed mountain, and looked out thence and seen the compass of the earth, and the circles of the round world, and therefore said, 'I have seen the end of all perfection.'"[316]

Augustine: "…this Christ's one Church, this the Unity which we are, is crying form the ends of the earth....But wherefore have I cried this thing? 'While my heart was being vexed.' He showeth himself to be throughout all nations in the whole round world, in great glory, but in great tribulation."[317]

Augustine: "…the earth more abundantly hath given her fruit, and that crop now hath filled the round world."[318]

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[312] *Orthodox Faith*, Book 2, chapter 10.
[313] *Hexameron*, Homily IV, 4.
[314] *Paedagogus* (also found in Clement of Rome).
[315] *City of God*, Bk XVI, Ch 9.
[316] *Homilies on First John*, Homily X, 5
[317] Homily on Psalm 61, 2.
[318] Homily on Psalm 67, 8.

Augustine: "…the whole round world repeopled by the three sons of Noe: for from East and West and North and South shall come they that shall sit down with the Patriarchs."[319]

Augustine: "Which thing signified, that, being as it were on a floor in the midst of the whole round world, the dry fleece was the former people Israel."[320]

Eusebius: "The sun and the moon have their settled course. The stars move in no uncertain orbits round this terrestrial globe. The revolution of the seasons recurs according to unerring laws. The solid fabric of the earth was established by the word: the winds receive their impulse at appointed times; and the course of the waters continues with ceaseless flow, the ocean is circumscribed by an immovable barrier, and whatever is comprehended within the compass of earth and sea, is all contrived for wondrous and important ends."[321]

Gregory of Nyssa: "For just as those skilled in astronomy tell us that the whole universe is full of light, and darkness is made to cast its shadow by the interposition of the body formed by the earth; and that this darkness is shut off from the rays of the sun, in the shape of a cone, according to the figure of the sphere-shaped body, and behind it; while the sun, exceeding the earth by a size many times as great as its own, enfolding it round about on all sides with its rays, unites at the limit of cone the concurrent streams of light; so that if (to suppose the case) any one had the power of passing beyond the measure to which the shadow extends, he would certainly find himself in light unbroken by darkness."[322]

Jerome: "…so all substance shall be refined into its most perfect form and rarified into aether which is a pure and uncompounded essence; or else the sphere which I have called motionless and all that it contains will be dissolved into nothing, and the sphere in which the antizone itself is contained shall be called 'good ground,' and that other sphere which in its revolution surrounds the earth and goes by the name of heaven shall be reserved for the abode of the saints."[323]

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[319] Homily on Psalm 69, 1

[320] Homily on Psalm 72, 9.

[321] *Life of Constantine*, Bk 2, Ch LVII.

[322] *On the Making of Man*, XXI, 3.

[323] Letters, 124, To Avitus.

- The Fathers knew the moon reflected light and traveled in a circle around the earth.

Gregory of Nyssa: “Do you not confidently maintain that it is so, because you have arrived by reasoning through phenomena at the conception of such and such a movement, of such distances of time and space, of such causes of eclipse? And when you look at the waning and waxing moon you are taught other truths by the visible figure of that heavenly body, *viz*. that it is in itself devoid of light, and that it revolves in the circle nearest to the earth, and that it is lit by light from the sun; just as is the case with mirrors, which, receiving the sun upon them, do not reflect rays of their own, but those of the sun, whose light is given back from their smooth flashing surface. Those who see this, but do not examine it, think that the light comes form the moon herself. But that this is not the case is proved by this; that when she is diametrically facing the sun she has the whole of the disc that looks our way illuminated; but, as she traverses her own circle of revolution quicker from moving in a narrower space, she herself has completed this more than twelve times before the sun has once traveled round his; whence it happens that her substance is not always covered with light.”[324]

John Chrysostom: “Perhaps each of you might wish to be such as to able to command the sun and moon. At this point what would they say who assert that the heaven is a sphere? For why did he not [merely] say, “Let the sun stand still,” but added “Let the sun stand still at the valley of Elom,” that is he will make the day longer? This was done also in the time of Hezekiah. The sun went back. This again is more wonderful than the other, to go the contrary way, not having yet gone round his course.”[325]

Cyril of Jerusalem: “…and the whole earth to the heaven in which it is embosomed; the earth, which bears the same proportion to the heaven as the center to the whole circumference of a wheel, for the earth is no more than this in comparison with the heaven.”[326]

- The Fathers recognized both the earth as the center of the universe, and that it is round, as noted by the stipulation that water goes “round the Earth.”

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[324] *On the Soul and the Resurrection.*

[325] *Homily on Hebrews*, Homily 8, 7.

[326] *Catechetical Lectures*, Lec 6, 3.

Athanasius: "And wells, again, and rivers will never exist without the earth; but the earth is not supported upon itself, but is set upon the realm of the waters, while this again is kept in its place, being bound fast at the center of the universe. And the sea, and the great ocean that flows outside round the whole earth, is moved and borne by winds wherever the force of the winds dashes it."[327]

- The Fathers were aware of how the Greeks understood the solar system.

Anatolious of Alexandria: "And Thales discovered the eclipse of the sun and its period in the tropics in its constant inequality. And Anaximander discovered that the earth is poised in space, and moves round the axis of the universe. And Anaximenes discovered that the moon has her light from the sun, and found out also the way in which she suffers eclipse. And the rest of the mathematicians have also made additions to these discoveries. We may instance the facts – that the fixed stars move round the axis passing through the poles, while the planets remove from each other round the perpendicular axis of the zodiac; and that the axis of the fixed stars and the planets is the side of a pente-decagon with four-and-twenty parts."[328]

Hippolytus: "For among them there are from the monad three double (numbers), *viz*., 2, 4, 8, and three triple ones, *viz*., 3, 9, 27. But the diameter of Earth is 80, 108 stadii, and the perimeter of Earth 250,543 stadii; and the distance also from the surface of the Earth to the lunar circle, Aristarchus computes at 8,000,178 stadii, but Apollonius 5,000,000, whereas Archimedes computes it at 5,544,1300. And from the lunar to solar circle, (according to the last authority), are 50,262,065 stadii; and from this to the circle of Venus, 20,272,065 stadii, and from this to the circle of Mercury, 50,817,165 stadii; and from this to the circle of Mars, 40,541,108 stadii; and from this to the circle of Jupiter, 20,275,065 stadii; and from this to the circle of Saturn, 40,372,065 stadii; and from this to the Zodiac and the furthest periphery, 20,082,005 stadii."[329]

- The Fathers agreed with most of the geometry of the Greek geocentrists, but condemned their belief in astrology.

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[327] *Against the Heathen*, First Book, Pat 1, 27.

[328] *The Paschal Canon*, Chapter XVII.

[329] *Refutation of All Heresies*, Bk 4, Ch 8

Methodius: “Resuming then, let us first lay bare, in speaking of those things according to our power, the imposture of those who boast as though they alone had comprehended from what forms the heaven is arranged, in accordance with the hypothesis of the Chaldeans and Egyptians. For they say that the circumference of the world is likened to the turnings of a well-rounded globe, the earth having a central point. For its outline being spherical, it is necessary, they say, since there are the same distances of the parts, that the earth should be the center of the universe, around which as being older, the heaven is whirling. For if a circumference is described from the central point, which seems to be a circle – for it is impossible for a circle to be described without a point, and it is impossible for a circle to be without a point, - surely the earth consisted before all, they say, in a state of chaos and disorganization. Now certainly the wretched ones were overwhelmed in the chaos of error, “because that, when they knew God, they glorified Him not as God, neither were thankful; but became vain in their imaginations, and their foolish heart was darkened.”[330]

Lactantius: “It followed, therefore, from this rotundity of the heaven, that the earth was enclosed in the midst of its curved surface. But if this were so, the earth also itself must be like a globe; for that could not possibly be anything but round, which was held enclosed by that which was round. But if the earth also were round, it must necessarily happen that it should present the same appearance to all parts of the heaven.”[331]

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[330] *Discourse On the Virgins*, Dis. VIII, Thekla, Ch XIV.

[331] *False Wisdom of Philosophers*, Bk 3, Ch 24, On the Antipodes.

The decrees against heliocentrism included in the formal sentence against Galileo Galileo, approved and facilitated by Pope Urban VIII, June 22, 1633[332]

"Che il sole sia centro del mondo et immobile di moto locale, è propositione assurda e falsa in filosofia, e formalmente heretica, per essere espressamente contraria alla Sacra Scrittura."

> (Translation: "The proposition that the sun is the center of the world and does not move from its place is absurd and false philosophically and formally heretical, because it is expressly contrary to the Holy Scripture")

"Che la terra non sia centro del mondo nè imobile, ma che si muova etiandio di moto diurno, è parimente propositione assurda e falsa nella filosofia, e considerate in teologia ad minus erronea in Fide."

> (Translation: "The proposition that the Earth is not the center of the world and immovable but that it moves, and also with a diurnal motion, is equally absurd and false philosophically and theologically considered at least erroneous in faith")

"The second problem with the liberal Catholic view is that it accepts without question the claims made on behalf of modern science."

David Wootton[333]

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[332] Original Italian of the decrees, as cited in *Galileo E L'Inquisizione*, Antonio Favaro, 1907, p. 143.

[333] *Galileo: Watcher of the Skies*, Yale Univeersity Press, 2010, p. 261.

Chapter 16

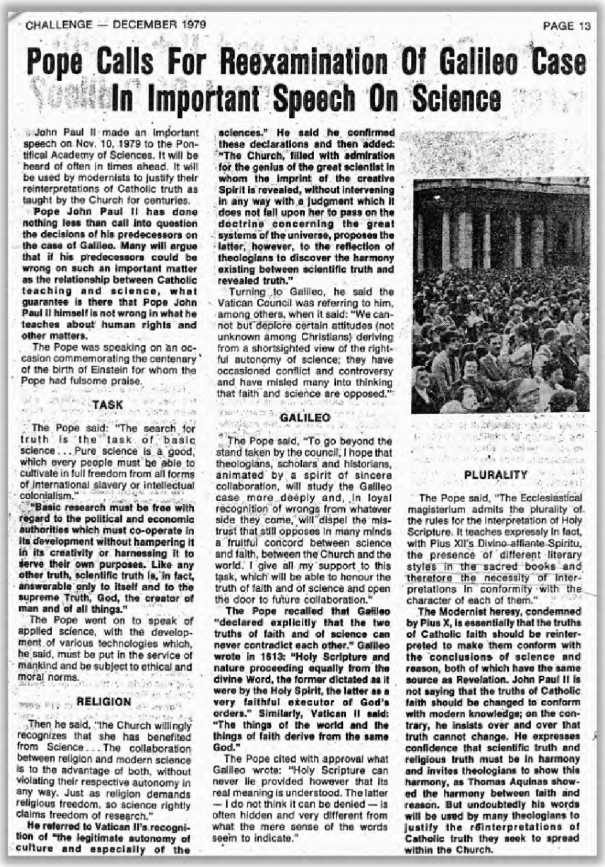
The Catholic Church's Teaching on Geocentrism

John Paul II Reexamines the Galileo Case

Most Catholics today, including many in the Vatican hierarchy, have been unduly stigmatized by the Galileo affair. Since almost everyone has accepted as a *fait accompli* that the heliocentric system is the operating model of cosmology, almost every apologetic issued from either the Catholic hierarchy or its lay scholars in the last hundred years has, in one form or another, been for the sole purpose of finding some rationale why previous popes and their heads of doctrine condemned the heliocentric system. But this type of apologetic has problems from the start. To be Catholic has always meant that what was decreed in the past remains decreed in the present. The Catholic accepts that those who issued our historic decrees did so under the guidance of the Holy Spirit. Unless, per chance, an equally authoritative decree overturned a previous one, it has been commonly understood that a Catholic was bound to give his full allegiance to the former. Hence the dilemma for the contemporary Catholic apologist is: (a) if the Holy Spirit was guiding the Church in the Galileo affair, and (b) if the Earth revolves around the sun, then how could the Church have been led to make such a tremendous and embarrassing blunder? Catholic apologists have agonized over this question for centuries. Unfortunately, almost all of them have tried to answer the dilemma by denying (a) and accepting (b). We have learned thus far in our treatise that the real truth is actually the reverse: the Holy Spirit was guiding the Church and heliocentrism is false.

Nevertheless, under the strain of appearing entrenched in an archaic medieval mentality and obtuse to the modern world, it was only a matter of time before the Catholic Church would readdress the Galileo affair in hopes of reconciling what were presumed to be the facts of science with the Church's official declarations about the truths of Scripture. No pope had even uttered the word "Galileo" in a public speech since 1633. The first to break the taboo was Paul VI in a passing reference to Galileo (along with Michelangelo and Dante) in a June 10, 1965 speech at Pisa. That the Church might soon address the Galileo case was already hinted at, however, in Vatican II's document *Gaudium et spes* in 1963:

> Consequently, we cannot but deplore certain habits of mind, which are sometimes found too among Christians, which do not sufficiently attend to the rightful independence of science and which, from the arguments and controversies they spark, lead many minds to conclude that faith and science are mutually opposed…. The recent studies and findings of science, history and philosophy raise new questions which effect life and which demand new theological investigations.[334]



CHALLENGE — DECEMBER 1979 PAGE 13

Pope Calls For Reexamination Of Galileo Case In Important Speech On Science

John Paul II made an important speech on Nov. 10, 1979 to the Pontifical Academy of Sciences. It will be heard of often in times ahead. It will be used by modernists to justify their reinterpretations of Catholic truth as taught by the Church for centuries.

Pope John Paul II has done nothing less than call into question the decisions of his predecessors on the case of Galileo. Many will argue that if his predecessors could be wrong on such an important matter as the relationship between Catholic teaching and science, what guarantee is there that Pope John Paul II himself is not wrong in what he teaches about human rights and other matters.

The Pope was speaking on an occasion commemorating the centenary of the birth of Einstein for whom the Pope had fulsome praise.

TASK

The Pope said: "The search for truth is the task of basic science…Pure science is a good, which every people must be able to cultivate in full freedom from all forms of international slavery or intellectual colonialism."

"Basic research must be free with regard to the political and economic authorities which must co-operate in its development without hampering it in its creativity or harnessing it to serve their own purposes. Like any other truth, scientific truth is, in fact, answerable only to itself and to the supreme Truth, God, the creator of man and of all things."

The Pope went on to speak of applied science, with the development of various technologies which, he said, must be put in the service of mankind and be subject to ethical and moral norms.

RELIGION

Then he said, "the Church willingly recognizes that she has benefited from Science…The collaboration between religion and modern science is to the advantage of both, without violating their respective autonomy in any way. Just as religion demands religious freedom, so science rightly claims freedom of research."

He referred to Vatican II's recognition of "the legitimate autonomy of culture and especially of the sciences." He said he confirmed these declarations and then added: "The Church, filled with admiration for the genius of the great scientist in whom the imprint of the creative Spirit is revealed, without intervening in any way with a judgment which it does not fall upon her to pass on the doctrine concerning the great systems of the universe, proposes the latter, however, to the reflection of theologians to discover the harmony existing between scientific truth and revealed truth."

Turning to Galileo, he said the Vatican Council was referring to him, among others, when it said: "We cannot but deplore certain attitudes (not unknown among Christians) deriving from a shortsighted view of the rightful autonomy of science; they have occasioned conflict and controversy and have misled many into thinking that faith and science are opposed."

GALILEO

The Pope said, "To go beyond the stand taken by the council, I hope that theologians, scholars and historians, animated by a spirit of sincere collaboration, will study the Galileo case more deeply and, in loyal recognition of wrongs from whatever side they come, will dispel the mistrust that still opposes in many minds a fruitful concord between science and faith, between the Church and the world. I give all my support to this task, which will be able to honour the truth of faith and of science and open the door to future collaboration."

The Pope recalled that Galileo "declared explicitly that the two truths of faith and of science can never contradict each other." Galileo wrote in 1613: "Holy Scripture and nature proceeding equally from the divine Word, the former dictated as it were by the Holy Spirit, the latter as a very faithful executor of God's orders." Similarly, Vatican II said: "The things of the world and the things of faith derive from the same God."

The Pope cited with approval what Galileo wrote: "Holy Scripture can never lie provided however that its real meaning is understood. The latter — I do not think it can be denied — is often hidden and very different from what the mere sense of the words seem to indicate."

PLURALITY

The Pope said, "The Ecclesiastical magisterium admits the plurality of the rules for the interpretation of Holy Scripture. It teaches expressly in fact, with Pius XII's Divino afflante Spiritu, the presence of different literary styles in the sacred books and therefore the necessity of interpretations in conformity with the character of each of them."

The Modernist heresy, condemned by Pius X, is essentially that the truths of Catholic faith should be reinterpreted to make them conform with the conclusions of science and reason, both of which have the same source as Revelation. John Paul II is not saying that the truths of Catholic faith should be changed to conform with modern knowledge; on the contrary, he insists over and over that truth cannot change. He expresses confidence that scientific truth and religious truth must be in harmony and invites theologians to show this harmony, as Thomas Aquinas showed the harmony between faith and reason. But undoubtedly his words will be used by many theologians to justify the reinterpretations of Catholic truth they seek to spread within the Church.

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[334] Vatican II, *Gaudium et spes* ¶36 and ¶62. As a matter of record, leading up to *Gaudium et spes*, Fr. George Coyne states: "several cultural and scientific associations (*Pax Romana*, *Union des Scientifiques Français*) and many individual scientists urged that there be a 'solemn rehabilitation of Galileo.' The efforts were in vain" ("The Church's Most Recent Attempt to Dispel the Galileo Myth," in *The Church and Galileo*, ed. Ernan McMullin, University of Notre Dame Press, p. 358). Later in this chapter we will address in detail the above statement from *Guadium et spes*.

It is no less a surprise that the one pope to take up the mantel and fill this lacuna of history would be **John Paul II** (1920-2005), one of the most cosmopolitan popes in the history of the Catholic Church. If there was ever a man who had the desire of reconciling the world with the Church it was Karol Wojtyla, who from his early years as a bishop of Poland sought peace and compromise between rivaling factions. The Galileo affair became just that chance and it was planned early in his pontificate (1979). For what it's worth, the pope's personal plane that escorted him across the world into more countries than any previous pope was dubbed, "The Galileo." In Kraców, Poland where he was a bishop, Karol Wojtyla was called "the Copernican Canon," which was rather fitting since Copernicus came from Poland.

The challenge before him, of course, was no easy one. Since John Paul II, by most counts, was personally convinced that both heliocentrism and evolution were about as close to scientific truth as science could offer, he had the unenviable task of explaining why his predecessors, if they were guided by the Holy Spirit as he believed all popes in matters of doctrine were guided, could be so wrong on such a basic truth of Holy Scripture. Of course, since we must be realistic, few could expect that the purpose behind John Paul II's attempted reconciliation would include the possibility that the popes and cardinals of the 17th century were right and Galileo was wrong. It is almost a certainty that the pope and the members of the commission he authorized to investigate the issue went into it with the *a priori* conviction that the previous popes and cardinals had made a serious error. In that light, we might say that the commission was biased and compromised from the beginning. Consequently, the commission believed that it had the responsibility to tell the world why the popes of yesteryear were mistaken, yet, perhaps, without explicitly admitting so.

John Paul II revealed his commission's findings in a speech to the Pontifical Academy of Science (PAS) in October of 1992.[335] As we will see, there seems to have been a larger hand at work which limited what would be said in the pope's speech, since what at first was expected to be a clear disavowal of the declarations of previous popes on the Earth's immobility actually turned out to be an open-ended treatise that, perhaps unbeknownst to its commission authors, somewhat preserved the sanctity of the decisions against Galileo. As one author put it: "…when the commission was finally wound up in 1992, its achievements fell short of what had been expected from it."[336]

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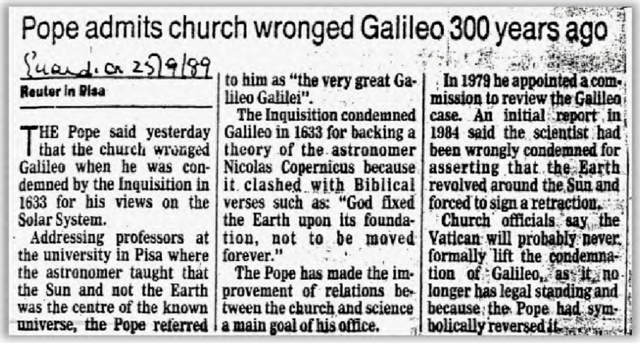
[335] The Pontifical Academy of Science has close to one hundred members. Candidates for membership are chosen by the Academy and are appointed for life by the pope. The Director of the Vatican Observatory, the Director of the Astrophysical Laboratory of the Vatican Observatory, the Prefect of the Vatican Library and the Prefect of the Secret Archives of the Vatican, are all members *pro tempore* and have the same rights and perform the same functions as the Pontifical Academicians. The scientific disciplines of the members are in nine fields: physics and related disciplines, astronomy, chemistry, the earth and environmental sciences, mathematics, the applied sciences, the philosophy and history of sciences, and the life sciences (*i.e.*, botany, agronomy, zoology, genetics, molecular biology, biochemistry, the neurosciences, and surgery). About a third of the members have won a Nobel Prize. Being a "pontifical" assemblage of scientists one would assume that the members would either be Christians or have some spiritual allegiance to the Catholic Church and/or the pope. The fact is, however, many of the PAS members profess no allegiance to Christianity, and many are avowed agnostics or atheists (*e.g.*, Stephen Hawking, Paul Davies). All of them have accepted the Darwinian and Copernican hypotheses and have made it clear they do not entertain any other views. Consequently, any scientific theory that depends on a significant degree of divine intrusion is more or less dismissed as either incredible or unscientific. Since the PAS has the most influence on the scientific information that is given to the pope or his papal commissions, it would be safe to assume that there is a pro-Copernican and pro-Darwinian bias to all the information it releases.

[336] Ernan McMullin, editor of *The Church and Galileo*, Univ. of Notre Dame Press, 2005, p. 2. McMullin adds: "the final report delivered to the Pontifical Academy of Sciences and the speech prepared for the pope for delivery on the same occasion were plainly inadequate from the historical standpoint," and in closing: "There has admittedly been disappointment, grave disappointment indeed…But it is in the spirit of that original invitation that this collection of essays was first conceived and is now presented" (p. 7). McMullin, of course, believes that heliocentrism has been scientifically proven and this is the reason for his "grave disappointment" in John Paul II's speech. He and his colleagues appear to want their pound of flesh from the Vatican and will accept nothing less than an



Pope admits church wronged Galileo 300 years ago

Guardian 25/9/89

Reuter in Pisa

THE Pope said yesterday that the church wronged Galileo when he was condemned by the Inquisition in 1633 for his views on the Solar System.

Addressing professors at the university in Pisa where the astronomer taught that the Sun and not the Earth was the centre of the known universe, the Pope referred to him as "the very great Galileo Galilei".

The Inquisition condemned Galileo in 1633 for backing a theory of the astronomer Nicolas Copernicus because it clashed with Biblical verses such as: "God fixed the Earth upon its foundation, not to be moved forever."

The Pope has made the improvement of relations between the church and science a main goal of his office.

In 1979 he appointed a commission to review the Galileo case. An initial report in 1984 said the scientist had been wrongly condemned for asserting that the Earth revolved around the Sun and forced to sign a retraction.

Church officials say the Vatican will probably never formally lift the condemnation of Galileo, as it no longer has legal standing and because the Pope had symbolically reversed it.

That a dissatisfied result could occur as it did is quite intriguing considering the initial impetus that formed the papal commission. On November 10, 1979, John Paul II gave a speech on the centenary of Einstein's birth and he stated: "Galileo had much to suffer…at the hand of individuals and institutions within the Church."[337] A fair question to ask is, what "individuals" could be in view other than Cardinal Robert Bellarmine

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admission of error in the Galileo affair. He hints at this goal by remarking on Monsignor Pietro Parente's comment (the co-president of the commission charged with writing *Gaudium et spes*) regarding the request to the Vatican to have *Gaudium et spes* "acknowledge the Church's error with regard to Galileo" but was answered with: "*It would ask the Church to say: I have been wrong*" (*ibid*., p. 7, the italicized words are Parente's, the non-italicized are McMullin's). On the issue of Scripture interpretation, McMullin gives the typical modern apologetic: "The disputed passages in Scripture were simply not relevant to the Copernican issue in the first place: the language of these passages was accommodated to the intended audience and hence not to be taken literally, and in any event astronomical truth lay outside the purposes for which Scripture was intended. But Bellarmine and the qualifiers evidently had set both those arguments aside" (*ibid*., p. 156). Again, basing his opinion on the idea that heliocentrism is a fact of science and that Pope Leo XIII's 1893 encyclical *Providentissimus Deus* accommodated the language of appearance to explain Scripture's cosmology (NB: in actuality, Leo referred neither to Scripture's cosmology nor the Galileo affair, as we will see later in this chapter), McMullin levies his strongest indictment against the 17th century Church: "…it follows that the rejection by Bellarmine and the qualifiers of the application of these principles constituted an objective error on their part, as well as on the part of Paul V and the members of the Holy Office who ratified the qualifiers' condemnation of the Copernican theses on the grounds that they were 'contrary to Scripture'" (*ibid*., pp. 158-159, emphasis added). It is clear that McMullin and his colleagues desired the same sort of admission from John Paul II's speech but did not receive it.

[337] John Paul II, "Discourse on the One Hundredth Anniversary of the Birth of Albert Einstein," *Acta Apostolicae Sedis* (Vatican: Tipografia Poliglotta Vaticana), 1979, vol. 71, p. 1464.

and Pope Paul V who in 1616 took the lead in thwarting Galileo; as well as Pope Urban VIII in 1633 who sentenced Galileo for saying things that were "vehemently suspect of heresy" and "opposed to Scripture"? What "institutions" could be in view other than the Inquisition and the *Index of Forbidden Books*? This was the speech in which the pope expressed the desire to have an intense study of the Galileo case, after which Cardinal Casaroli, the Secretary of State, organized the commission known as the *Studi Galileiani* in 1981. But when the address to the Pontifical Academy of Science was finally aired eleven years later in 1992, there was no indictment of "individuals and institutions within the Church" but only what was politely categorized as a "mutual incomprehension" between Galileo and "the theologians of the day." There is also no mention in the speech that the Earth moves, the main point of contention between Galileo and the Church. In other words, if the listener to the 1992 speech was waiting to hear a formal disavowal of the decisions made by Bellarmine, Paul V and Urban VIII, it was not there. What remained in the speech was much less than what may have been originally intended. Overall, the speech itself has enough ambiguities and theological and scientific loopholes within its short 3000-word content that either party, the pro-Galilean or the anti-Galilean, could extract support for their view.[338] The same type of non-committal remarks seem evident in the pope's September 22, 1989 speech at Pisa in which a Reuter's reporter described one "Church official" as interpreting the pope to have only "symbolically reversed" the decrees against Galileo.[339]

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[338] As an example of the variance, Maurice Finocchiaro remarks from his pro-Galilean stance that, "John Paul did not, however, explicitly endorse Poupard's report. Although he accepted some particular conclusions, in the context of the papal speech those theses lost the anti-Galilean flavor and implications they possessed in Poupard's speech. If this interpretation of John Paul's speech is correct, and if it is correct to say that the Vatican commission studies had been acquiring an increasing anti-Galilean tone and apologetic flavor, then perhaps one may conjecture that the pope was closing the Galileo case because he wanted to close the retrial of Galileo at the hand of people such as Poupard and Brandmüller" (*Retrying Galileo, 1633-1992*, Berkeley, University of California Press, 2005, p. 357).

[339] Original story from *The Guardian* of September 25, 1989, followed in *L'Osservatore Romano*, October 10, 1989. Here the pope says only that Galileo was "an essential stage in the methodology," and that his work was merely part of "the journey towards the world's knowledge of nature," not that heliocentrism is a proven fact of science.

An Analysis of John Paul II's 1992 Speech on Galileo

After receiving the commission's results in 1990, as noted above, the pope gave a short speech on the Galileo matter to the Pontifical Academy of Science in October 1992. With little surprise, the world's newspapers invariably interpreted whatever the pope said in his speech as a complete and utter concession to Galileo. The *Los Angeles Times* headline read: "Earth Moves for Vatican in Galileo Case – Vatican Admits Error in 17th Century Case." The *Washington Post* chimed: "Vatican Says Galileo Right After All – Three Centuries Later, Pope Admits Error." The opening paragraph of the *Arlington Catholic Herald* followed suit: "Pope John Paul II formally acknowledged that the church erred when it condemned 17th century astronomer Galileo Galilei for maintaining that the earth revolved around the sun."

Suffice it to say, the reality is somewhat different. As it stands, the 1992 speech was a private affair between the pope and the Academy, but it goes without saying that the larger audience, even if uninvited, was the rest of the world, for surely all were waiting to hear the pope's personal verdict on one of the most famous and controversial cases in ecclesiastical history. If there is any official level to the pope's speech, the Vatican has not specified what it is, but we assume that it has at least some lower level of authority. For the time being it is probably best to call it the Church's most recent prudential judgment on the Galileo affair, pending a more definitive judgment in the future. What we know for certain, however, is that the 1992 speech is the Church's most involved and most public dealing with the Galileo affair in close to two centuries.[340]

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[340] The only authoritative guidelines we have for assessing the different degrees of assent/respect due to non-infallible papal teaching are the three criteria given in Lumen Gentium 25 §1. The Council says we must respond in each case according to the Pope's "mind and intention," which "is made known principally either by the character of the documents in question (NB: the 1992 papal allocution to the Pontifical Academy of Science is a low-level papal document), or by the frequency with which a certain doctrine is proposed (NB: the 1992 allocution is the only one in which a pope said there were errors in the Galileo case), or by the manner in which the doctrine is formulated (NB: the 1992 allocution contains no solemn or authoritative language, and nothing stating that all Catholics must hold the position espoused by the speech). On such low-level papal statements we are to treat the pope's opinion with respect, but we have the right and duty to disagree if we believe he is wrong. Per Canon 212 §3 of the 1983 Code of Canon Law: "According to the knowledge, competence, and prestige which they possess, they ["the Christian faithful" from §2] have the right and even at times the duty to manifest to the sacred pastors their opinion on matters which pertain to the good of the Church and to make their opinion known to the rest of the Christian faithful,

Although the Vatican has not specified that this papal speech carries any particular ecclesiastical authority, the mere fact that it came from the pope who represents both the authority of the Church and his papal predecessors, means that the speech carries its own practical and pastoral weight, for a pope must be very judicious about the things he says, even if they are not definitively expressed, for the masses invariably interpret them as the voice of the Church. In addition, even though the pope himself may not have been the actual author of the speech, nevertheless, he must necessarily take responsibility for his own spoken words, for it is to him, not his underlings, that we look for the Church's position.[341]

If the speech was prepared for the pope, it would be well to scrutinize it in light of who was the most influential person on the papal commission of authors. In this case, the pope indicates that **Cardinal Paul Poupard** bears most of the responsibility for the historical and scientific information contained in the speech, since the pope stated clearly: "I would like to express my sincere gratitude to Cardinal Poupard, who was entrusted with coordinating the Commission's research in its concluding phase."[342] This may have been one of the reasons that the speech was originally written in French, since

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without prejudice to the integrity of the faith and morals, with reverence toward their pastors, and attentive to common advantage and the dignity of persons."

[341] McMullin reveals that the address to the Pontifical Academy of Science was a "speech prepared for the pope" (*The Church and Galileo*, p. 2).

[342] Poupard gave a speech prior to and on the same day as the pope on October 31, 1992 to the Pontifical Academy of Science, but records of this are not readily available. Poupard's speech is titled: "Address at the Conclusion of the Proceedings of the Pontifical Study Commission on the Ptolemaic-Copernican Controversy in the 16th and 17th Centuries," and an English translation was published in *Origins* 22, Nov. 12, 1992, pp. 370-375, with the original in *Après Galilée*, Paris: Desclée de Brouwer, 1994, pp. 93-97. As for the commission itself, the Vatican Secretary of State, Cardinal Agostino Casaroli, named Cardinal Gabriel-Marie Garrone as president of the commission, and Fr. Enrico di Rovasenda, who was then chancellor of the Pontifical Academy of Science from 1974 to 1986, as his assistant. Six others were invited to the commission: Archbishop Carlo Maria Martini for the exegetical section; Archbishop Paul Poupard for the culture section; Professor Carlos Chagas and Fr. George Coyne for the section on scientific and epistemological questions; Msgr. Michele Maccarrone and Fr. Edmond Lamalle for historical and juridical questions.

Cardinal Poupard is not only French, but when the commission was formed he was the Archbishop of Paris and the president of the *Institut Catholique* in Paris.[343]

By Poupard's own admission, he went into the investigation believing that Galileo was right and the Church was wrong. In 1992 he stated:

> The philosophical and theological qualifications, abusively attributed to the new theories regarding the centrality of the sun and the mobility of the earth, were the consequence of a period of transition in the realm of the knowledge of astronomy, and an exegetical confusion regarding cosmology….We need to recognize there errors as Your Holiness asked.[344]

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[343] It is also significant that Cardinal Poupard aligns himself more with the liberal school of both theology and biblical exegesis. He is also known to have a great admiration for Pierre Teilhard de Chardin. Teilhard's works were banned by the Church in the monitum of John XXIII of June 30, 1962 stating that his books contained "ambiguities and grave doctrinal errors." Regarding the Galileo affair, Teilhard made a direct connection between the fall of geocentrism and the rise of evolutionary theory and a rejection of the traditional teaching on Original Sin: Teilhard writes: "As a result of the collapse of geocentrism, which she has come to accept, the Church is now caught between her historico-dogmatic representation of the world's origin, on the one hand, and the requirements of one of her most fundamental dogmas on the other – so that she cannot retain the former without to some degree sacrificing the latter. With the end of geocentrism, what was emerging was the evolutionist point of view. All that Galileo's judges could distinctly see as menaced was the miracle of Joshua. The fact was that in consequence the seeds of decomposition had been introduced into the whole of the Genesis theory of the fall: and we are only today beginning to appreciate the depth of the changes which at that time were already potentially completed." (Teilhard de Chardin, "Fall, Redemption and Geocentrism," *Christianity and Evolution*, 1969, 1971, pp. 37-38). Fr. George Coyne, former director of the Vatican observatory, who is mentioned in the pope's speech as one who worked in close collaboration with Poupard, also aligns himself more with the liberal theological and exegetical school of thinking, as well as being a very vocal advocate of both heliocentrism and evolution (having also denounced Intelligent Design as "unscientific"), and has been highly critical of how the Church treated Galileo. Coyne believes that neither Bellarmine nor the popes following listened to Galileo's scientific claims, stating, "neither in 1616 nor in 1633 was any science discussed" ("The Church's Most Recent Attempt to Dispel the Galileo Myth," p. 342). But this assertion is certainly not true. Science may not have been the main focus, but it was certainly discussed, and both Bellarmine and Urban VIII told Galileo he had no scientific proof despite Galileo's claims to the contrary.

[344] *L'Osservatore Romano*, Nov. 1992, pp. 2-3, as cited in Atila S. Guimarães, "The Swan Song of Galileo's Myth," in *Tradition in Action*., nd, np.

As such, if there are some errors of fact in the papal speech, it is Cardinal Poupard who shares the brunt of the responsibility. As we will see, there are, indeed, quite a few such factual errors, as well as an equal number of erroneous conclusions from those errors. Still, some hold that "neither the final report nor the papal discourse appear to reflect the majority of the conclusions which are enunciated in the official publications of the Commission," which again suggests that the commission originally intended to be much more lenient on Galileo and much harder on the Church than what the papal speech turned out to be.[345]

A Logical and Inevitable Warning to the Church

Before we analyze the pope's speech, we need to reiterate one important point. If an individual is predisposed to believe that the heliocentric model is correct and that the popes and cardinals of the 1600s were in error in condemning Galileo, this stance not only creates an unbearable tension between the popes of today and the popes of the past, but it also, ironically, calls into question the ability of present popes and cardinals to judge the issue correctly, or to judge any issue correctly, barring a clear declaration of infallibility. The average man in the street sees this logic quite clearly. For example, the article in the *Challenge* periodical noted above ("Pope Calls For Reexamination Of Galileo Case In Important Speech On Science") mentions this conundrum for the pope in its opening statement:

> Pope John Paul II has done nothing less than call into question the decisions of his predecessors on the case of Galileo. Many will argue that if his predecessors could be wrong on such an important matter as the relationship between Catholic teaching and science, what guarantee is there that Pope John Paul II himself is not wrong in what he teaches about human rights and other matters?[346]

The concern of the *Challenge* reporter is logical. Once it is posited that the former theologians of the Catholic Church made a pastoral error by refusing to listen to science and insisting on a literal interpretation of Scripture, this assessment, by force of logic, leaves today's theologians of the Catholic Church open to an equal but opposite error. That is, they themselves may be refusing to listen to the scientific evidence against their view, and, consequently, they may be giving the wrong pastoral advice to their flock by erroneously promoting a non-literal interpretation of Scripture. This is the inevitable trap into which Church officials fall when they question or reject previous high-level decisions in the ecclesiastical tradition. In short, no one can deny this simple logic: if those of the past can err, then those of the present can err. To be more specific, if the popes of the seventeenth century who approved the condemnations against heliocentrism could err, then current popes who approve the reigning opinions of modern science can also err. Ironically, the modern Church is 'hoist by its own petard,'[347] for if the Holy Spirit, who does not lie, was not guiding the aforementioned popes and their Sacred Congregations during the inquisition of Galileo on an issue of such great pastoral importance, how can we be sure the Holy Spirit is guiding the present pastors of the Church? In fact, we are left with an even more haunting question: if the Holy Spirit was not guiding the pastors of the past, then who was guiding them? The intractable nature of this problem is reinforced by the fact that, according to the modern Church, neither the seventeenth century papal sanction against Copernicanism, namely, that it was "formally heretical" "erroneous in faith" and "opposed to Scripture," nor the twentieth century papal speech that "theologians did not recognize the formal distinction between Sacred Scripture and its interpretation," are, to use Cardinal Poupard's own word, "irreformable."

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[345] The words of Fr. George Coyne, commission member for science and epistemology ("The Church's Most Recent Attempt to Dispel the Galileo Myth," in *The Church and Galileo*, p. 354.

[346] *Challenge* newspaper, London, Dec. 1979, page 13.

As much as John Paul II, who, by common accounts personally believed in heliocentrism, desired to correct what he understood were the errors of the past, he inadvertently admits that he himself is subject to error in judging the past. In a public but unofficial speech to journalists in May 1983, John Paul II stated:

> To you who are preparing to commemorate the 350th anniversary of the publication of the great work of Galileo, *Dialogue Concerning the Two Chief World Systems*, I would like to say that the experience lived by the Church at the time of and following upon the Galileo case, has permitted a maturing and more concrete understanding of the authority which is proper of the Church. Thus is it understood more clearly that divine Revelation, of which the Church is guarantor and witness, does not involve as such any scientific theory of the universe and the assistance of the Holy Spirit does not in any way come to

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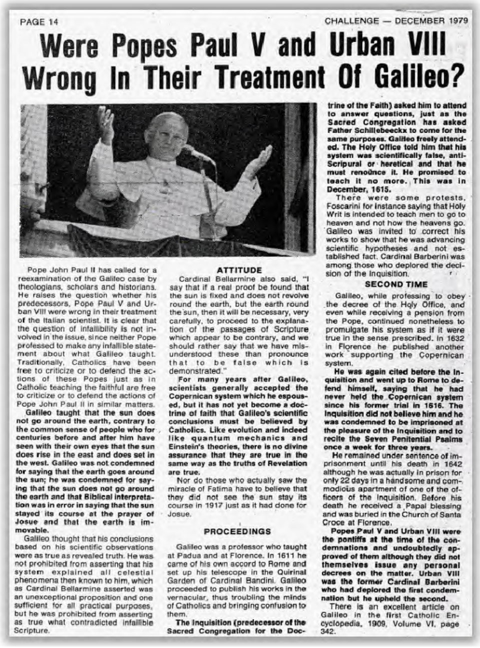
[347] The expression "hoist by one's own petard" first appeared in Shakespeare's play, Hamlet, meaning "to blow oneself up with one's own bomb, be undone by one's own devices."

guarantee explanations which we might wish to maintain on the physical constitution of reality. That the Church was able to go ahead with difficulty in a field so complex, should neither surprise nor scandalize. The Church, founded by Christ who has declared himself to be the Way, the Truth, and the Life, remains nonetheless composed of limited human beings who are an integral part of their cultural epoch.[348]



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CHALLENGE — DECEMBER 1979

Were Popes Paul V and Urban VIII Wrong In Their Treatment Of Galileo?

Pope John Paul II has called for a reexamination of the Galileo case by theologians, scholars and historians. He raises the question whether his predecessors, Pope Paul V and Urban VIII were wrong in their treatment of the Italian scientist. It is clear that the question of infallibility is not involved in the issue, since neither Pope professed to make any infallible statement about what Galileo taught. Traditionally, Catholics have been free to criticize or to defend the actions of these Popes just as in Catholic teaching the faithful are free to criticize or to defend the actions of Pope John Paul II in similar matters.

Galileo taught that the sun does not go around the earth, contrary to the common sense of people who for centuries before and after him have seen with their own eyes that the sun does rise in the east and does set in the west. Galileo was not condemned for saying that the earth goes around the sun; he was condemned for saying that the sun does not go around the earth and that Biblical interpretation was in error in saying that the sun stayed its course at the prayer of Josue and that the earth is immovable.

Galileo thought that his conclusions based on his scientific observations were as true as revealed truth. He was not prohibited from asserting that his system explained all celestial phenomena then known to him, which as Cardinal Bellarmine asserted was an unexceptional proposition and one sufficient for all practical purposes, but he was prohibited from asserting as true what contradicted infallible Scripture.

ATTITUDE

Cardinal Bellarmine also said, "I say that if a real proof be found that the sun is fixed and does not revolve round the earth, but the earth round the sun, then it will be necessary, very carefully, to proceed to the explanation of the passages of Scripture which appear to be contrary, and we should rather say that we have misunderstood these than pronounce that to be false which is demonstrated."

For many years after Galileo, scientists generally accepted the Copernican system which he espoused, but it has not yet become a doctrine of faith that Galileo's scientific conclusions must be believed by Catholics. Like evolution and indeed like quantum mechanics and Einstein's theories, there is no divine assurance that they are true in the same way as the truths of Revelation are true.

Nor do those who actually saw the miracle of Fatima have to believe that they did not see the sun stay its course in 1917 just as it had done for Josue.

PROCEEDINGS

Galileo was a professor who taught at Padua and at Florence. In 1611 he came of his own accord to Rome and set up his telescope in the Quirinal Garden of Cardinal Bandini. Galileo proceeded to publish his works in the vernacular, thus troubling the minds of Catholics and bringing confusion to them.

The Inquisition (predecessor of the Sacred Congregation for the Doctrine of the Faith) asked him to attend to answer questions, just as the Sacred Congregation has asked Father Schillebeeckx to come for the same purposes. Galileo freely attended. The Holy Office told him that his system was scientifically false, anti-Scripural or heretical and that he must renounce it. He promised to teach it no more. This was in December, 1615.

There were some protests, Foscarini for instance saying that Holy Writ is intended to teach men to go to heaven and not how the heavens go. Galileo was invited to correct his works to show that he was advancing scientific hypotheses and not established fact. Cardinal Barberini was among those who deplored the decision of the Inquisition.

SECOND TIME

Galileo, while professing to obey the decree of the Holy Office, and even while receiving a pension from the Pope, continued nonetheless to promulgate his system as if it were true in the sense prescribed. In 1632 in Florence he published another work supporting the Copernican system.

He was again cited before the Inquisition and went up to Rome to defend himself, saying that he had never held the Copernican system since his former trial in 1616. The Inquisition did not believe him and he was condemned to be imprisoned at the pleasure of the Inquisition and to recite the Seven Penitential Psalms once a week for three years.

He remained under sentence of imprisonment until his death in 1642 although he was actually in prison for only 22 days in a handsome and commodious apartment of one of the officers of the Inquisition. Before his death he received a Papal blessing and was buried in the Church of Santa Croce at Florence.

Popes Paul V and Urban VIII were the pontiffs at the time of the condemnations and undoubtedly approved of them although they did not themselves issue any personal decrees on the matter. Urban VIII was the former Cardinal Barberini who had deplored the first condemnation but he upheld the second.

There is an excellent article on Galileo in the first Catholic Encyclopedia, 1909, Volume VI, page 342.

Although, on the one hand, this statement could be understood as John Paul II's realization that divine revelation does not address issues such as whether nature operates on the basis of Quantum Mechanics, String Theory or Einsteinian Relativity, on the other hand, the implication is strong that John Paul is speaking about the Galileo affair and saying that the seventeenth century ecclesiastical authorities made their alleged mistakes because they were "limited human beings who [were] an integral part of their cultural epoch." Odd as it may seem coming from a pope of the Catholic Church, this statement appears to divest these clerical authorities of any guidance or protection from the Holy Spirit. It is as if in order to get the Church off the hook, as it were, John Paul II resorts to saying that God ignored the Church for an indefinite period of time, and which, unfortunately, resulted in the Church succumbing to the dark side of the "culture" of that day. Needless to say, it is a frightening scenario that John Paul visualizes here. Those who think deeply about the implications of what he is saying cannot honestly draw any long-term comfort from it. It inevitably makes every "reformable" teaching of the Church come under the black cloud of suspicion, including the "reformable" teachings of John Paul II himself.

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[348] Discourse to the Symposium, Nos. 2 & 3. Fantoli, *Galileo: For Copernicanism and for the Church*, p. 509; *The Case of Galileo: A Closed Question*?, p. 235.

In brief, the problems with John Paul II's assessment of the situation in his May 1983 speech are threefold. First, the "cultural epoch" of John Paul II is no more certain of the "physical constitution of reality" than the cultural epoch from four centuries prior. For example, as we noted in Volume I, the three major scientific theories cited above (Quantum Mechanics, String Theory and Einsteinian Relativity) diametrically contradict one another. We have also seen that Einsteinian Relativity has declared its native inability to tell us which of the two major celestial bodies, the sun and the Earth, revolves around the other, since both space and movement, by definition, are relative. At least the seventeenth century prelature had a conviction of which celestial body was revolving and which was not, and they based it on Scripture and Tradition.

Second, the "limited human beings" in the Church whom John Paul II says were responsible for these alleged miscues are, unfortunately, still with us in the Church today, regardless how much they seek to elevate themselves above their 17th century counterparts. Modern society, including the moral scandals and loss of faith that even John Paul II admitted were concurrent with his own pontificate, is certainly no closer to God than those who lived four centuries prior.[349] As such, as much as Paul V and Urban VIII are considered "limited human beings," so John Paul II cannot escape the same "limitation," especially on the coattails of the confusing array of theories in modern science.

Third, in faulting the prelature of the past, John Paul II puts himself in the dubious position of having to choose the lesser of two evils to exonerate the Church at large. On the one hand, if it is accepted that his papal predecessors were wrong in condemning heliocentrism, then, although John Paul saves the modern Church on one count, he inevitably makes it a miserable failure on another count, for he now has the insurmountable problem of explaining how the Church of the past, which claimed to be guided by the Holy Spirit just as much as the Church of the present, could have been duped into thinking that true cosmology was even addressed by Scripture, much less erroneously concluding that the sun revolved around the Earth. No appeal to the "cultural epoch" is going to explain why all the Fathers, all the medievals, all the popes, all the saints, all the doctors, all the theologians and all the parishioners of the Catholic Church for almost the last two millennia could be led into such a stark and raving error regarding the interpretation of Scripture and the revolutions of the heavenly bodies until modern science (most of which is atheistic and totally confused itself as to how the universe operates, along with a Catholic Church since Vatican II that has certainly not exhibited the highest moral and doctrinal standards we have seen in previous ecclesiastical eras) came along to enlighten us to the indisputable and irreformable truth, respectively. That is the first of the two evils.

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[349] John Paul II himself said just one month into his pontificate: "We are now standing in the face of the greatest historical confrontation humanity has gone through. I do not think that wide circles of the American society or wide circles of the Christian community realize this fully. We are now facing the final confrontation between the church and the anti-Church, of the Gospel versus the anti-Gospel" (*Wall Street Journal*, Nov. 9, 1978)."

The second of the two evils is this: if John Paul's papal predecessors were right, it is obviously even more devastating for the Church at large, for: (a) John Paul II would be in error in stating that the previous Church was in error; (b) he would be in error in believing heliocentrism is true; (c) he would be in error in not discovering his two-fold error; (d) he would demonstrate that he, not the Church of the past, was not being guided by the Holy Spirit, at least in regard to personal opinions such as those he expressed in May 1983 and October 1992 to the world's scientists.

How Then Should the Church Proceed?

Well then, are we doomed to pick the lesser of two evils? The answer is no. Fortunately, there is a way out of this dilemma, and it will come, ironically, from none other than John Paul II himself as he gives the admonition in his 1992 speech to the Pontifical Academy of Science. He states:

> It is a duty for theologians to keep themselves regularly informed of scientific advances in order to examine…whether or not there are reasons for taking them into account in their reflection or for introducing changes in their teaching.[350]

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[350] John Paul II, address to the Pontifical Academy of Science, November 4, 1992, ¶8. John Paul II said a similar thing to the PAS in an address on the subject of evolution on October 22, 1996: "For my part, when I received those taking part in your academy's plenary assembly on October 31, 1992, I had the opportunity with regard to Galileo to draw attention to the need of a rigorous hermeneutic for the correct interpretation of the inspired word. It is necessary to determine the proper sense of Scripture, while avoiding any unwarranted interpretations that make it

Keeping "regularly informed of scientific advances" so that theologians can "introduce changes in their teaching" is precisely what our book is encouraging modern theologians to do. The same direction was given by Cardinal Casaroli, the then Vatican Secretary of State, to the pope's Galileo commission on July 3, 1981. It stated at the outset that there should be neither an intention to overturn the decisions of the seventeenth century popes nor to craft a rehabilitation of Galileo. The marching orders were simply to "rethink" the Galileo affair. As Casaroli put it:

> The aim of the various groups should be to rethink the whole Galileo question, with complete fidelity to historically documented facts and in conformity to the doctrine and culture of the time, and to recognize honestly, in the spirit of the Second Vatican Council and of the quoted speech of John Paul II, rights and wrongs from whatever side they come. This is not to be the review of a trial or a rehabilitation, but a serene and objectively founded reflection, in the context of today's historical-cultural epoch.[351]

Essentially, this means that Galileo affair is open; it has not ended. We await a final resolution to it. Thus, as we "rethink" the Galileo affair and theologians begin to see that there is no scientific proof for heliocentrism and that geocentrism has much more scientific credibility than previously reported, they will, as John Paul II admonished them, have enough information to "introduce changes in their teaching" as they consider the facts of science in a whole new way, leading, hopefully, to a moratorium on apologizing for the popes and cardinals of the seventeenth century and, in turn, giving them the respect they are due as stewards of the Gospel who promoted the inerrancy of Holy Writ. Once an honest, studious and open-minded analysis is made of the scientific evidence, one will be able to see that the Holy Spirit was, indeed, behind the scenes guiding the Church of yesteryear to censor moving-Earth cosmology and, in turn, insist that we take Scripture's propositions at face value. Without

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say what it does not intend to say. In order to delineate the field of their own study, the exegete and the theologian must keep informed about the results achieved by the natural sciences (*cf.* AAS 85 1/81993 3/8, pp. 764-772; address to the Pontifical Biblical Commission, April 23, 1993, announcing the document on the The Interpretation of the Bible in the Church: AAS 86 1/81994 3/8, pp. 232-243).

[351] Quoted from Casaroli, 1981, as translated by M. Segre in "Light on the Galileo Case?" in *Isis* 88, pp. 500-501, as cited in *Retrying Galileo*, p. 344.

scientific proof for heliocentrism, today's Church is under no obligation to entertain it as more than a curious hypothesis, and, consequently, she is neither under divine compulsion nor can she claim any justifiable reason to abandon the literal interpretation of Scripture. As St. Augustine once said:

> But if they are able to establish their doctrine with proofs that cannot be denied, we must show that this statement of Scripture…is not opposed to the truth of their conclusions.[352]

Suffice it to say, modern science has never provided the world with "proofs that cannot be denied" to back up its steadfast devotion to heliocentrism. In that light, Pope Leo XIII made Augustine's teaching concerning the interpretation of Scripture into Catholic doctrine, following the Tradition of the Church:

> But he must not on that account consider that it is forbidden, when just cause exists, to push inquiry and exposition beyond what the Fathers have done; provided he carefully observes the rule so wisely laid down by St. Augustine – not to depart from the literal and obvious sense, except only where reason makes it untenable or necessity requires.[353]

Simply put, without scientific proof for heliocentrism, there is no "reason" or "necessity" to "depart from the literal and obvious sense" of Scripture. As physicist Henri Poincaré understood it from the side of science: "We do not have and cannot have any means of discovering whether or not we are carried along in a uniform motion of translation."[354] Einstein was thus forced to conclude:

> Either coordinate system could be used with equal justification. The two sentences: "the sun is at rest and the Earth moves," or "the sun moves and the Earth is at rest," would simply mean two

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[352] *The Literal Interpretation of Genesis* Book 2, Chapter 9, paragraph 21.

[353] Encyclical letter of 1893, *Providentissimus Deus*. The "Fathers," as we have seen in Chapter 13 were all avowed geocentrists in the face of many of the Greek philosophers and astronomers who were espousing heliocentrism.

[354] Poincaré's lecture titled: "L'état actuel et l'avenir de la physique mathematique," St. Louis, Sept. 24, 1904, *Scientific Monthly*, April, 1956. Commenting on Poincaré's work, Arthur Webster stated in 1913: "This [special relativity] principle is no less than a fundamental relation between time and space, intended to explain the impossibility of determining experimentally whether a system, say the Earth, is in motion or not" ("Henri Poincaré as Mathematical Physicist," *Science*, Vol. 38, Issue 991, Dec. 26, 1913, p. 907).

> different conventions concerning two different coordinate systems.[355]

In an ironic sort of way, Einstein's statement about the essential equality of differing "coordinate systems" is remarkably similar to what Cardinal Bellarmine told Fr. Foscarini when the latter insisted that the heliocentric system was correct. Being the astute intellectual he was, Bellarmine, like Einstein, easily saw how relativity and/or mathematics could save the appearances of either system. Bellarmine had taught astronomy in a number of Jesuit colleges.[356] He knew the arguments of celestial motion on both sides of the aisle. But, going beyond relativity, he also knew that, despite the geometrical equivalence, only one system could be the correct one. Thus, to Foscarini he writes:

> First. I say that it seems to me that Your Reverence and Galileo did prudently to content yourself with speaking hypothetically, and not absolutely, as I have always believed that Copernicus spoke. For to say that, assuming the earth moves and the sun stands still, all the appearances are saved better than with eccentrics and epicycles, is to speak well; there is no danger in this, and it is sufficient for mathematicians. But to want to affirm that the sun really is fixed in the center of the heavens and only revolves around itself without traveling from east to west, and that the earth is situated in the third sphere and revolves with great speed around the sun, is a very dangerous thing, not only by irritating all the philosophers and scholastic theologians, but also by injuring our holy faith and rendering the Holy Scriptures false.

As we have shown in the preceding volumes the evidence for why the Holy Spirit led our previous popes to condemn any model that required the Earth to move is so abundant that, in consideration of the fact that modern science has admitted both that it cannot prove heliocentrism and that geocentrism is not only a perfectly viable model but in many respects it is the more logical answer to the scientific data, it is the world that now owes an apology to the Catholic Church. In this light, Catholic scientist, author, and former professor of the Massachusetts Institute of Technology, Wolfgang Smith writes:

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[355] *The Evolution of Physics: From Early Concepts to Relativity and Quanta*, Albert Einstein and Leopold Infeld, New York, Simon and Schuster, 1938, 1966, p. 212. As Fred Hoyle notes: "…according to the physical theory developed by Albert Einstein [the heliocentric and geocentric systems] are indeed physically equivalent to each other" (*Astronomy and Cosmology*, p. 8).

[356] A manuscript of his course in astronomy from 1570-72 is housed at the University of Louvain.

> If there has been little debate in recent times on the subject of geocentrism, the reason is clear: almost everyone takes it for granted that the geocentrist claim is a dead issue, on a par, let us say, with the flat-Earth hypothesis. To be sure, the ancient doctrine has yet a few devoted advocates in Europe and America, whose arguments are neither trivial nor uninformed; the problem is that hardly anyone else seems to care, hardly anyone is listening. Even the biblically oriented creation-science movement, which of late has gained a certain prestige and influence, has for the most part disavowed geocentrism. The fact remains, however, that geocentrist cosmology constitutes not only an ancient, but indeed a traditional doctrine; should we not presume that as such it enshrines a perennial truth? To maintain, moreover, that this truth has nothing to say on a cosmographic plane – that the doctrine, in other words, is "merely symbolic or allegorical" – to think thus is to join the tribe of theologians who are ever willing to "demythologize" at the latest behest of the scientific establishment. It will not be without interest, therefore, to investigate whether the geocentrist claim – yes, understood cosmographically! – had indeed been ruled out of court. I shall urge that it has not. As regards the Galileo controversy, I propose to show that Galilean heliocentrism has proved to be scientifically untenable, and that in fact the palm of victory belongs to the wise saintly Cardinal Bellarmine.[357]

Smith's words are confirmed when we see the common rationale behind the thousands of histories written on the Galileo affair. All of the historians take for granted that heliocentrism has been scientifically proven. Thus they write their analyses of the historical events with that self-assured presumption as their foundation. Few, if any, have ever made a critical investigation of the purported proofs for a moving Earth. Instead, they resign themselves to parrot the *status quo* of modern science. Their treatises are repetitious attempts to turn over every rock and look into every crevice of the historical situation hoping to find the silver bullet that reveals the "real" reason why the Church was so hard on Galileo,[358] yet during the entire course of their research they are totally incapable of finding that reason, for they have already dismissed the notion of a fixed Earth as a remote, if not a laughable assertion. Maurice Finocchiaro, one of the more respected Galileo historians, admits in the opening pages of his latest work that he is driven to uncover every detail of the Galileo affair because, as he says, "a key recurring question has been whether, how, and why the condemnation was right or wrong, and that is what the title *Retrying Galileo* is meant to convey."[359] But Finocchiaro, although he makes no claims to knowing the science, pursues his unrelenting quest believing firmly that although

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[357] Wolfgang Smith, *The Wisdom of Ancient Cosmology: Contemporary Science in Light of Tradition*, p. 149. Feyerabend adds: "the tradition defended by the Church had interesting ancestors in antiquity and has progressive defenders today….And almost all philosophers of science writing today would have agreed with Bellarmino that Copernicus's case was very weak indeed" (*Farewell to Reason*, pp. 248, 257).

> Galileo did not provide a valid scientific proof of the earth's motion…this demonstration was available in 1820 after a number of other discoveries: Newton's universal gravitation (1687), Bradley's stellar aberration (1729), Guglielmini's eastward deflection of falling bodies (1789-1792), and Calandrelli's annual stellar parallax (1806).[360]

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[358] For example, Pietro Redondi, in his book *Galileo Heretic* (1982, 1987), says that the real reason the Church was so hard on Galileo was not because of Copernicanism but because Galileo's theory of "atomism" in *The Assayer* (1623) was in direct conflict with the doctrine of the Eucharist, despite the fact that there is no indication in the official documents that such was the case. As Feyerabend notes: "what Galileo says about atomism in the *Assayer* is much too brief and indefinite to conflict with transubstantiation (it is an aside almost, not an elaborate statement) and with the exception of a rather problematic document no such conflict was perceived" (*Against Method*, p. 115).

[359] Maurice Finocchiaro, *Retrying Galileo*, 2005, p. ix.

[360] *Ibid*., p. 348. As we discovered in Volume I, neither the laws of gravity, stellar aberration, stellar parallax, nor the deflection of falling bodies, prove that the earth is in motion. Every presumed proof for heliocentrism can be equally explained from a geocentric perspective, since the same forces and motions will occur if the Earth is rotating in a fixed universe or the universe is rotating around a fixed Earth. As far as modern science is concerned, there is no difference between these two models. But Finocchiaro is apparently oblivious to the alternative explanation, concluding that Newton's laws can only show that "the sun has such a greater mass and is so much closer to the said center [of mass] that it moves much less than all the other planets" and thus concludes "the principle foundation of the prohibition [against Galileo and the heliocentric system] no longer subsists…" (*ibid*., p. 145). Finocchiaro's claim of the discovery of parallax by Calendrelli in 1806 is dubious. As Macpherson notes: "The one pre-Herschelian problem in sidereal astronomy was the distance of the stars. Owing to its bearing on the

As Wolfgang Smith has noted above, however, anyone today who has made an honest investigation into the scientific merits of geocentrism; as well as uncovered the unproven assumptions of heliocentrism, will easily recognize that Finocchiaro's proposed "demonstrations" of a moving earth are totally baseless, yet (and we speak with no exaggeration in pointing out that) these alleged "demonstrations" are the foundation for everything Finocchiaro has written on the Galileo affair. Obviously, if the foundation of his critique is fallacious, then so are the conclusions he draws from them, and which applies to every other author who is puzzled why the Church condemned heliocentrism.

Detailed Analysis of John Paul II's 1992 Speech

With these preliminary facts in the background, we will now proceed to analyze John Paul II's speech to the Pontifical Academy of Science. The following English translation of the pope's address, which was originally given in French, appeared in *L'Osservatore Romano* N. 44 (1264) on November 4, 1992. Key comments of the pope's speech have been underlined for emphasis.

> **Papal Speech:** Your Eminences, Your Excellencies, Ladies and Gentlemen,
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> 1. The conclusion of the plenary session of the Pontifical Academy of Sciences gives me the pleasant opportunity to meet its illustrious members, in the presence of my principal collaborators and the Heads of the Diplomatic Missions accredited to the Holy See. To all of you I offer a warm welcome.
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> My thoughts go at this moment to Professor Marini-Bettolo, who is prevented by illness from being among us, and, assuring

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Copernican theory, the problem was attacked by the astronomers of the seventeenth and eighteenth centuries. Herschel made numerous attempts to detect the parallax of the brighter stars, but failed. Meanwhile there had been many illusions. Piazzi believed that his instruments – which in reality were worn out and unfit for use – had revealed parallaxes in Sirius, Aldebaran, Procyon and Vega; Calendrelli, another Italian, and John Brinkley (1763-1835), Astronomer Royal of Ireland, were similarly deluded; and in 1821 it was shown by Friedrich Georg Wilhelm Struve (1793-1864), the great German astronomer, that no instrument then in use could possibly be successful in measuring the stellar parallax" (Hector Macpherson, *A Century's Progress in Astronomy*, William Blackwood and Sons, Edinburgh and London, 1906, pp. 150-151).

> him of my prayers, I express fervent good wishes for his restoration to health.
>
> I would also like to greet the members taking their seats for the first time in this Academy; I thank them for having brought to your work the contribution of their lofty qualifications.
>
> In addition, it is a pleasure for me to note the presence of Professor Adi Shamir, of the Weizmann Institute of Science at Rehovot, Israel, holder of the Gold Medal of Pius XI, awarded by the Academy, and to offer him my cordial congratulations.
>
> Two subjects in particular occupy our attention today. They have just been ably presented to us, and I would like to express my gratitude to Cardinal Paul Poupard and Fr. George Coyne for having done so.
>
> I. 2. In the first place, I wish to congratulate the Pontifical Academy of Sciences for having chosen to deal, in its plenary session, with a problem of great importance and great relevance today: the problem of the emergence of complexity in mathematics, physics, chemistry and biology.
>
> The emergence of the subject of complexity probably marks in the history of the natural sciences a stage as important as the stage which bears relation to the name of Galileo, when a univocal model of order seemed to be obvious. Complexity indicates precisely that, in order to account for the rich variety of reality, we must have recourse to a number of different models.

Analysis: This is the first indication that the speech is going to take a general view of the entire subject and dispel the notion that it is a black and white issue. It appeals to "complexity" precisely because modern science has discovered, despite Newtonian science, trying to figure out what is revolving around what is not as easy as it was once thought to be. As we noted in Volume I, one could make a model choosing any point in the universe as the center and subsequently calculate by Fourier analysis what the precise revolutions of the surrounding bodies must be on a purely mathematical basis. Since modern science believes all bodies are in motion, there is no means of preferring one mathematical system over the other. Hence, the appeal to "having recourse to a number of different models," whether they be the Ptolemaic, the Copernican, the Keplerian, the Brahian, the Einsteinian, or any combination of the above, seems to establish a neutral ground from which the speech seeks to prime its readers who may come to the issue believing that it is a simple case of exonerating heliocentrism and rejecting geocentrism. The speech recognizes that the issue is much more complex. Later in the speech, the pope again refers to the "emergence of complexity" and the "theme of complexity," showing that it is a consistent line of argumentation for his analysis of the situation.

> **Papal Speech**: This realization poses a question which concerns scientists, philosophers and theologians: how are we to reconcile the explanation of the world – beginning with the level of elementary entities and phenomena – with the recognition of the fact that "the whole is more than the sum of its parts"?
>
> In his effort to establish a rigorous description and formalization of the data of experience, the scientist is led to have recourse to metascientific concepts, the use of which is, as it were, demanded by the logic of his procedure. It is useful to state exactly the nature of these concepts in order to avoid proceeding to undue extrapolations which link strictly scientific discoveries to a vision of the world, or to ideological or philosophical affirmations, which are in no way corollaries of it. Here one sees the importance of philosophy which considers phenomena just as much as their interpretation.
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> 3. Let us think, for example, of the working out of new theories at the scientific level in order to take account of the emergence of living beings. In a correct method, one could not interpret them immediately and in the exclusive framework of science. In particular, when it is a question of the living being which is man, and of his brain, it cannot be said that these theories of themselves constitute an affirmation or a denial of the spiritual soul, or that they provide a proof of the doctrine of creation, or that, on the contrary, they render it useless.
>
> A further work of interpretation is needed. This is precisely the object of philosophy, which is the study of the global meaning of the data of experience, and therefore also of the phenomena gathered and analyzed by the sciences.
>
> Contemporary culture demands a constant effort to synthesize knowledge and to integrate learning. Of course, the successes which we see are due to the specialization of research. But unless this is balanced by a reflection concerned with articulating the various branches of knowledge, there is a great risk that we shall have a "shattered culture," which would in fact be the negation of true culture. A true culture cannot be conceived of without humanism and wisdom.
>
> II. 4. I was moved by similar concerns on 10 November 1979, at the time of the first centenary of the birth of Albert Einstein, when I expressed the hope before this same Academy that "theologians, scholars and historians, animated by a spirit of

sincere collaboration, will study the Galileo case more deeply and, in frank recognition of wrongs from whatever side they come, dispel the mistrust that still opposes, in many minds, a fruitful concord between science and faith."(1) A Study Commission was constituted for this purpose on 3 July 1981. The very year when we are celebrating the 350th anniversary of Galileo's death, the Commission is presenting today, at the conclusion of its work, a number of publications which I value highly. I would like to express my sincere gratitude to Cardinal Poupard, who was entrusted with coordinating the Commission's research in its concluding phase. To all the experts who in any way took part in the proceedings of the four groups that guided this multidisciplinary study, I express my profound satisfaction and my deep gratitude. The work that has been carried out for more than 10 years responds to a guideline suggested by the Second Vatican Council and enables us to shed more light on several important aspects of the question. In the future, it will be impossible to ignore the Commission's conclusions.

One might perhaps be surprised that at the end of the Academy's study week on the theme of the emergence of complexity in the various sciences, I am returning to the Galileo case. Has not this case long been shelved and have not the errors committed been recognized?

That is certainly true. However, the underlying problems of this case concern both the nature of science and the message of faith. It is therefore not to be excluded that one day we shall find ourselves in a similar situation, one which will require both sides to have an informed awareness of the field and of the limits of their own competencies. The approach provided by the theme of complexity could provide an illustration of this.

5. A twofold question is at the heart of the debate of which Galileo was the centre.

The first is of the epistemological order and concerns biblical hermeneutics. In this regard, two points must again be raised. In the first place, like most of his adversaries, Galileo made no distinction between the scientific approach to natural phenomena and a reflection on nature, of the philosophical order, which that approach generally calls for. That is why he rejected the suggestion made to him to present the Copernican system as a hypothesis, inasmuch as it had not been confirmed by irrefutable proof. Such therefore, was an exigency of the experimental method of which he was the inspired founder.

Analysis: The foregoing concurs with the history of the situation. Galileo was permitted to expound on his heliocentric system for practical purposes just as long as he did not consider it the actual model of the cosmos. The key point, however, is that John Paul II recognizes that without "irrefutable proof" the Church is under no obligation to consider heliocentrism as a fact of science. Consequently, if the lack of irrefutable proof persists to the present day, then the Church is likewise required to take the same stance it did in the days of Galileo – it must continue to favor geocentrism for it is clearly the model advocated by Scripture and 1600 years of Christian teaching prior to Galileo. As we have noted in Volume 1, there is no "irrefutable proof" that the Earth moves around the sun. In this light, Augustine warns us:

> I have learnt that a man is not in any difficulty in making a reply according to his faith which he ought to make to those who try to defame our Holy Scripture. When they are able, from reliable evidence, to prove some fact of physical science, we shall show that it is not contrary to our Scripture. But when they produce from any of their books a theory contrary to Scripture, and therefore contrary to the Catholic faith, either we shall have some ability to demonstrate that it is absolutely false, or at least we ourselves will hold it so without any shadow of a doubt. And we will so cling to our Mediator, in whom are hidden all the treasures of wisdom and knowledge, that we will not be led astray by the glib talk of false philosophy or frightened by the superstition of false religion.[361]

In fact, much of the scientific evidence reveals that the Earth is motionless. As we noted earlier, one scientist concluded regarding the 1887 Michelson-Morley experiment:

> It is both amusing and instructive to speculate on what might have happened if such an experiment could have been performed in the sixteenth or seventeenth centuries when men were debating the rival merits of the Copernican and Ptolemaic systems. The result would surely have been interpreted as conclusive evidence for the immobility of the Earth, and

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[361] *The Literal Meaning of Genesis*, Book 1, Chapter 21, Para. 42, in *Ancient Christian Writers*, *op. cit.*, p. 45.

> therefore as a triumphant vindication of the Ptolemaic system and irrefutable falsification of the Copernican hypothesis.[362]

The pope continues:

> **Papal Speech**: Secondly, the geocentric representation of the world was commonly admitted in the culture of the time as fully agreeing with the teaching of the Bible of which certain expressions, taken literally seemed to affirm geocentrism. The problem posed by theologians of that age was, therefore, that of the compatibility between heliocentrism and Scripture.

Analysis: Here we have an admission that, if the Bible is taken literally, it affirms, or seems to affirm, geocentrism. It also acknowledges the basis upon which the popes and cardinals of the 1600s formed their argument against Galileo, that is, it was first and foremost "opposed to Scripture." It also means that, if one were to reject the teaching of geocentrism, he must necessarily reject the literal interpretation of Scripture. Although lessening the traditional strictures on literal interpretation may appear to be possible by simply shifting the principles of hermeneutics, it is not so easy when one considers that the hallmark of Catholic biblical interpretation for the 1600 years prior to Galileo was a persistent and uncompromising literal interpretation of Scripture. This methodology gave the Church such crucial doctrines as Baptismal Regeneration, which, when reading the words of Jesus in John 3:5, "Unless a man is born of water and the Spirit he cannot enter the kingdom of heaven," the Church interpreted them as only and distinctly applicable to the literal application and effect of water as the means by which salvation was procured. The Church did the same with the words of Jesus in Matthew 26:26, "This is my body," which have been literally interpreted as being the actual body of Jesus Christ. Moreover, this staunchly literal interpretation of Scripture was produced in the face of not being able to explain regeneration or transubstantiation in a scientific way, and in the face of opposition from other sects, both then and now, insisting that we interpret Jesus' words symbolically rather than literally. Surely, if the Lord can make his body present in the Eucharist, yet, as it were, "save the appearances" of the bread and wine, then he would have no trouble putting the Earth in the center of the universe and having the latter revolve around the former. Literal exegesis of Scripture is the undeniable legacy of Catholic biblical interpretation, and thus the burden of proof is certainly on the exegete who seeks to depart from it.

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[362] G. J. Whitrow, *The Structure and Evolution of the Universe*, London, Hutchinson and Co., 1959, p. 79.

> **Papal Speech**: Thus the new science, with its methods and the freedom of research which they implied, obliged theologians to examine their own criteria of scriptural interpretation. Most of them did not know how to do so.

Analysis: It was not so much that they "did not know how to do so," but that they simply did not feel compelled to do it. As even John Paul II noted in the above paragraph, there would be no good reason for them to change their interpretive methodology unless "irrefutable proof" for heliocentrism could be produced. Bellarmine, who took the lead in the exegetical issues of this case, plainly acknowledged in his remarks to Galileo that if such proof existed, he would not be censoring Galileo and he would not have adhered to a traditional and literal biblical hermeneutic. If there had been such proof, the Church would only need to say that when Scripture spoke about the sun moving around a stationary Earth this would be considered phenomenological language as opposed to literal language. But it is precisely this dramatic paradigm shift of biblical hermeneutics that the seventeenth century Church was not willing to initiate (since all of the Church's previous doctrines were created by a literal interpretation of Scripture) unless forced to do so by irrefutable scientific proofs; proofs, we might add, that were not existent then and are not existent now.

> **Papal Speech**: Paradoxically, Galileo, a sincere believer, showed himself to be more perceptive in this regard than the theologians who opposed him. "If Scripture cannot err," he wrote to Benedetto Castelli, "certain of its interpreters and commentators can and do so in many ways."(2) We also know of his letter to Christine de Lorraine (1615) which is like a short treatise on biblical hermeneutics.(3)

Analysis: Whether Galileo was a "sincere believer" is not something that we, 350 years removed from his day, may be able to judge, at least in the early and middle stages of his life. As we have outlined earlier, Galileo's personal life was certainly not the model of saintly living. The ill treatment of his mistress and children, along with his well-known pride and arrogance, are not the typical acts of a sincere Christian believer. Galileo may have been passionate about his science and his wish to make Scripture conform to it, but there is certainly room to doubt whether Galileo was a personally devout man of God. It is only in the latter stages of his life and, ironically, when he renounced Copernicanism a year before his death, do we find evidence that Galileo was humble and repentant of his former days. Interestingly enough, the pope's commission, which had been working on the Galileo issue for at least nine years (1981-1990), makes absolutely no mention of Galileo's eventual rejection of heliocentrism, even though it is common knowledge among reputable scholars who are familiar with Galileo's life.

The remark that Galileo "showed himself more perceptive…than the theologians who opposed him" or that his letter to Christine is a "short treatise on biblical hermeneutics," gives much more credit to Galileo than he is deserving, at the same time that it disregards the well-known Scriptural erudition of someone like Robert Cardinal Bellarmine. What evidence exists (other than the question-begging assertion that the "theologians" were wrong about geocentrism) that the prelature did not know how to "examine their own criteria for scriptural interpretation"? The theologians of the seventeenth century were well-trained exegetes, and this is the very reason they were able to stem the tide of the Protestant rebellion that was occurring about the same time. How could they be so astute against Protestant theology yet so obtuse against Galileo's theology? Moreover, these particular theologians had the Council of Trent in their exegetical arsenal, and the Council was clear that no deviation from a patristic consensus was allowed in Catholic biblical interpretation. As the record shows, if there was ever a consensus of Fathers that believed firmly in one doctrine, it was the consensus on geocentrism. Conversely, Galileo had no formal training in biblical interpretation and hardly ventured into any noteworthy studies of Scripture, except when he was required to do so in an effort to support his heliocentric theory. We have already seen examples in Chapter 14 of Galileo's faulty exegesis skills. One of the few examples we have of Galileo exegeting a text of Scripture, Joshua 10:10-14, is quite elementary and fanciful.[363] The details of exegesis neither interested Galileo nor did he have any skill to accomplish such a task. Galileo always spoke in generalities about Scripture for it was the philosophical approach to interpretation that he wanted desperately to change in order to make room for heliocentrism. In fact, as we will see later, Galileo's appeal to Scripture was contradictory. On the one hand, he argued against the astronomical authority of Scripture and on the other hand he assumed Scripture's authority in order to develop Copernican interpretations of problematic passages.[364] Moreover, Galileo made no recourse to the Fathers or the medievals or the history of the popes and councils that went before him. Galileo was, in fact, demanding a total paradigm shift of biblical interpretation for the sake of one issue, an issue that neither he nor anyone else had proven or even could prove to anyone's satisfaction. Of course, if one thinks that modern science has proven indisputably that heliocentrism is true, he would certainly be predisposed to accept why the papal commission would conclude that Galileo was "more perceptive" than Bellarmine.

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[363] Fantoli tries to escape the scholarly consensus on this point by suggesting that Galileo meant his interpretation of Joshua 10 to be an "ad hominem" attack against those who insisted that Joshua really intended to stop the sun, but there is no suggestion in Galileo's words for such a conclusion. It appears to be another case, frequently employed in his book, of Fantoli seeking to insulate Galileo from criticism and promote the heliocentric system (Annibale Fantoli, *Galileo: For Copernicanism and for the Church*, pp. 207-208).

[364] This particular contradiction was noticed by Maurice Finocchiaro in the analysis of Carlos Chagas' Preface to Rinaldo Fabris' 1986 monograph on Galileo

> **Papal Speech**: 6. From this we can now draw our first conclusion. The birth of a new way of approaching the study of natural phenomena demands a clarification on the part of all disciplines of knowledge. It obliges them to define more clearly their own field, their approach, their methods, as well as the precise import of their conclusions. In other words, this new way requires each discipline to become more rigorously aware of its own nature.
>
> The upset caused by the Copernican system thus demanded epistemological reflection on the biblical sciences, an effort which later would produce abundant fruit in modern exegetical works and which has found sanction and a new stimulus in the Dogmatic Constitution Dei Verbum of the Second Vatican Council.

Analysis: Here we see one of the most significant yet most disturbing admissions from the modern prelature about what the Galileo affair did to Catholic hermeneutics. Once geocentrism had been rejected because it was assumed that science had proven heliocentrism, the Bible would never be looked at the same again. If the Fathers of the Church, the medieval theologians, and the prelature were wrong about interpreting the Bible as providing literal and accurate truth concerning history and the cosmos, then this would forever set the stage for limiting the Bible's domain. This "new way" is dictated by the fact that it is assumed the seventeenth century Church was wrong to insist the Bible could be taken at face value. It is a cataclysmic shift in thinking that is comparable to no other in the history of the Church. As we will see later, this is precisely why Bellarmine was so adamant against it.

The "new way" is followed by a "new stimulus" in biblical interpretation supposedly given by Vatican II's document, *Dei Verbum*. As

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published by the Pontifical Academy of Sciences. It is also pointed out that "contemporary theologians were split about whether Scripture was a philosophical authority" (*Retrying Galileo*, p. 347).

most biblical scholars know, *Dei Verbum* contains a very controversial phrase which many in the Catholic prelature and Catholic academia have taken as a license to assert that Scripture is inerrant only when it speaks about matters of salvation. Fr. Poupard, Fr. Coyne and the rest of the papal commission follow this new school of thought. Many seminaries, universities, secondary schools and new bible translations have adopted it since Vatican II closed its doors in 1965. The sentence in question is from paragraph 11 of *Dei Verbum* and reads as follows:

> Since, therefore, all that the inspired authors, or sacred writers, affirm should be regarded as affirmed by the Holy Spirit, we must acknowledge that the books of Scripture, firmly, faithfully and without error, teach that truth which God, for the sake of our salvation, wished to see confided to the sacred Scriptures.[365]

The phrase that modern biblical scholarship has seized upon in order to advance the idea that Scripture is inerrant only when it speaks on salvation is "for the sake of our salvation." In effect, what would normally be interpreted as nothing more than an affirmation that God made all of Scripture inerrant so that we can have a sure foundation upon which we can attain salvation, has now been turned into an excuse for why Scripture is not inerrant when it speaks on history and science – a view of Scripture never before taught in the Catholic Church.

A good example of this neo-orthodox view of the Bible is in the works of the late Fr. Raymond Brown, editor of the *New Jerome Biblical Commentary*, and one of the most influential Catholic theologians in the world. He writes: "Scriptural teaching is truth without error to the extent that it conforms to the salvific purpose of God."[366] In another work he writes:

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[365] Austin Flannery, *Vatican Council II, The Conciliar and Post Conciliar Documents*, New York, Costello Publishing Co. second printing, 1977, p. 757. The edition of Walter M. Abbot has a slightly different syntax: "Therefore, since everything asserted by the inspired authors or sacred writers must be held to be asserted by the Holy Spirit, it follows that the books of Scripture must be acknowledged as teaching solidly, faithfully and without error that truth which God wanted put into sacred writings for the sake of salvation." Flannery puts the clause "for the sake of our salvation" immediately after "God," thus indicating God's motivation for giving us Scripture, *i.e.*, so that we can be saved. In the Abbott edition, "for the sake of our salvation" is put at the end of the sentence and which might suggest that it modifies "truth" rather than "God." For a thorough analysis and refutation of this thesis please see Fr. Brian Harrison's penetrating critique: "The Truth and Meaning of Scripture According to *Dei Verbum 11*," in *Living Tradition*, No. 59, July 1995 located at the archives of the rcforum.org.

> In the last hundred years we have moved from an understanding wherein inspiration guaranteed that the Bible was totally inerrant to an understanding wherein inerrancy is limited to the Bible's teaching of 'that truth which God wanted put into the sacred writing for the sake of our salvation.' In this long journey of thought the concept of inerrancy was not rejected but was seriously modified to fit the evidence of biblical criticism which showed that the Bible was not inerrant in questions of science, of history, and even of time-conditioned religious beliefs.[367]

Essentially, the degree of the Bible's inerrancy was made flexible in order to make room for heliocentrism. The modern exegete was now required to recognize the presence of error in Scripture, which then led him to separarate the error-free salvific message from the error-filled historical/scientific message. This new hermeneutic was the applied to science. Fr. Raymond Brown, himself was a staunch evolutionist, attributed a significant amount of his *New Jerome Biblical Commentary* to the theory of evolution, basing his view on the supposition that, since the Bible was not inerrant when it spoke about cosmogony or cosmology, he had every right to espouse evolution. Secular scientists began to use the same rationale. Carl Sagan, the world's premier cosmologist until his recent death, speaks of the Church "censoring alternative views and threatening to torture" but then couples that in the next paragraphs with:

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[366] *New Jerome Biblical Commentary*, p. 1169.

[367] *The Virginal Conception and Bodily Resurrection of Jesus*, Paulist Press, 1973, pp. 8-9. He adds: "Historical and critical studies of doctrine may lead to a similar modification of an over-simplified understanding of the infallibility of Church teaching….While the public admission of historical relativity in doctrinal formulations is a recent phenomenon in official Catholicism….A clear example is the variation in the last 125 years in the presentation of the Church's teaching about evolution. The Church has infallibly taught the doctrine that God was specially involved in creating man in His image and likeness. For almost 1900 years that theological doctrine was interpreted to include the how of man's creation, namely, by direct divine action forming man's body from the earth, and woman's body from man's. Today no serious theologian accepts this understanding of the how, because of the scientific evidence favoring evolution; yet the changed understanding of the how has not negated the infallibility of the Church's teaching for we have learned to distinguish between the theological insight and the physical imagery in which it was clothed" (*ibid*, p. 9).

> But if the Bible is not everywhere literally true, which parts are divinely inspired and which are merely infallible and human? As soon as we admit there are scriptural mistakes (or concessions to the ignorance of the times), then how can the Bible be an inerrant guide to ethics and morals?[368]

As we noted in earlier chapters, however, the Church has been very clear that *all* of Scripture is inerrant, whether it is speaking of salvation, history, the cosmos or any other propositional truth. There simply is no precedent for interpreting the phrase "for the sake of our salvation" as anything more than the reason the Bible, *in toto*, was made inerrant by the Holy Spirit, that is, so there would be no doubt about the veracity of the entire message of God who cannot lie and who leads us to salvation. The footnotes of *Dei Verbum* 11 make this truth perfectly clear as it quotes from the same Fathers, theologians, popes and councils that Bellarmine and Urban VIII depended upon to condemn the cosmology of Galileo and uphold the total inerrancy of Holy Writ.[369]

> **Papal Speech**: 7. The crisis that I have just recalled is not the only factor to have had repercussions on biblical interpretation. Here we are concerned with the second aspect of the problem, its pastoral dimension.
>
> By virtue of her own mission, the Church has the duty to be attentive to the pastoral consequences of her teaching. Before all else, let it be clear that this teaching must correspond to the truth. But it is a question of knowing how to judge a new scientific datum when it seems to contradict the truths of faith. The pastoral judgment which the Copernican theory required was difficult to make, in so far as geocentrism seemed to be a part of scriptural teaching itself. It would have been necessary all at once to overcome habits of thought and to devise a way of teaching capable of enlightening the people of God. Let us say, in a general way, that the pastor ought to show a genuine

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[368] *Pale Blue Dot*, pp. 40, 42.

[369] Immediately after the sentence "…the books of Scripture, firmly, faithfully and without error, teach that truth which God, for the sake of our salvation, wished to see confided to the sacred Scriptures," *Dei Verbum 11* gives footnotes from five sources stating that Scripture is inerrant in its totality. They are: (1) St. Augustine's *The Literal Interpretation of Genesis* 2, 9, 20 and *Epistle* 82, 3. (2) St. Thomas, *De Veritatis*, q. 12, a. 2; (3) The Council of Trent, Ses. IV, *de canonicis Scripturas* (Denz. 783; (4) Leo XIII's *Providentissimus Deus*: EB 121, 124, 126, 127; (5) Pius XII's *Divino Afflante*: EB 539. None of these sources state or suggest that Scripture is only inerrant when it speaks on salvation.

> boldness, avoiding the double trap of a hesitant attitude and of hasty judgment, both of which can cause considerable harm.

Analysis: Here we see somewhat of an anachronistic treatment of the mentality of the seventeenth century prelature and its theologians. We can safely say that it was not "necessary to overcome habits of thought" simply because there was no proof of Galileo's universe. As such, the best way for the Church of that day to "be attentive to the pastoral consequences of her teaching," was to maintain her complete trust in the Bible so that the parishioners under them would do the same. If the prelature were to succumb to the theories of Galileo and subsequently teach the populace that Scripture was no longer to be trusted when it spoke on history or the cosmos, we can imagine what kind of confusion this would have caused in their minds, especially in the wake of such upheavals as the Protestant rebellion, the Renaissance and the beginnings of the Enlightenment that were occurring concurrently with the Galileo affair and its aftermath. This was one of the most tumultuous times in the history of the Church. The right pastoral choice would have been to adhere to the tradition of the Church which always held Scripture as the highest authority on all that it addressed, and which was subservient to no intellectual pursuit of man, especially one that had no proof for its conjectures.

> **Papal Speech**: 8. Another crisis, similar to the one we are speaking of, can be mentioned here. In the last century and at the beginning of our own, advances in the historical sciences made it possible to acquire a new understanding of the Bible and of the biblical world. The rationalist context in which these data were most often presented seemed to make them dangerous to the Christian faith. Certain people, in their concern to defend the faith, thought it necessary to reject firmly based historical conclusions. That was a hasty and unhappy decision. The work of a pioneer like Fr Lagrange was able to make the necessary discernment on the basis of dependable criteria.

Analysis: Although the speech does not specifically name its concern, its reference to the "advances of the historical sciences" and "firmly-based historical conclusions" is alluding to the modern invention of "historical biblical criticism," such as the theory of Julius Wellhausen and his followers who theorized that the Old Testament, in particular the Pentateuch, was written by different authors at widely separated times. As we discuss in Chapters 14 and 17 concerning the interpretation of Genesis 1-2, the Wellhausen theory holds that Genesis 2 is a much earlier account than Genesis 1, the latter written by an author in the "Priestly" ranks during the return of Israel from Babylonian captivity around 515 B.C. Of the two accounts, then, Genesis 2 is said to be the more "historical," while Genesis 1 is made to be an effort by the Jews to make the God of Israel more powerful than the Babylonian god, Marduk, so that the Jews could be invigorated to believe that their God would restore their previous fortunes. In other words, today's biblical scholars claim that Genesis 1 is a fabricated story. This so-called "historical criticism" is completely at odds with the traditional view that the Church held for the 1900 years prior, namely, that Moses wrote the Pentateuch and did so by providing us with historical accounts that were completely reliable and chronologically accurate, from the Creation, to the Fall, to the Tower of Babel, to the Flood and beyond. Although it is true that in 1918 Catholic exegete Fr. M. J. Lagrange separated the good from the bad in the Wellhausen and other "historical critical" theories, by the late 1940s and beyond many Catholic biblical scholars paid little attention to his warnings, accepting the Wellhausen theory and other like-minded theories with little reservation. Cardinal Poupard, for example, was well known for accommodating many of these liberal theories of biblical hermeneutics at his *Institut Catholique* in Paris.

> **Papal Speech**: It is necessary to repeat here what I said above. It is a duty for theologians to keep themselves regularly informed of scientific advances in order to examine if such be necessary, whether or not there are reasons for taking them into account in their reflection or for introducing changes in their teaching.

Analysis: We have already remarked on the impact this statement has on the discussion. Suffice it to say, if the theologians of today are required to "keep themselves regularly informed of scientific advances" in order to adjust their theological teachings, it would be well for them to delve into the merits of geocentric science, for as we have seen in the first two volumes of this series, the evidence for a central and immobile Earth is quite overwhelming. We should also remark that if "theologians" are to keep themselves regularly informed of scientific advances, then so are the popes and bishops of the Church, for it is they who have the final authority over theologians as to what the Church officially teaches.

> **Papal Speech**: 9. If contemporary culture is marked by a tendency to scientism, the cultural horizon of Galileo's age was uniform and carried the imprint of a particular philosophical formation. This unitary character of culture, which in itself is positive and desirable even in our own day, was one of the reasons for Galileo's condemnation. The majority of theologians

> did not recognize the formal distinction between Sacred Scripture and its interpretation, and this led them unduly to transpose into the realm of the doctrine of the faith a question which in fact pertained to scientific investigation.

Analysis: That the Church of Galileo's day "carried the imprint of a particular philosophical formation" is actually not a detriment to its usefulness but its best asset. The Church was both Augustinian and Thomistic, the former leaning more toward Platonic philosophy and the latter more toward the Aristotelian, although there was much mixing depending on the subject matter. These thought paradigms helped the Church both universalize and particularize its doctrines and its outlook on the world. The fact is, those paradigms withstood the test of time. The only significant challenges to them came from the physical sciences, since there was a certain independence that scientific endeavor assumed by its very nature. But the Church's "philosophical formation" had already accommodated such challenges. As we noted previously, a thousand years earlier Augustine stated quite clearly that if science could provide irrefutable proofs for its claims, the Church would be more than willing to modify its interpretations of Scripture. Bellarmine posed the same thing to Galileo, and thus the "philosophical formation" was consistent. Moreover, literal interpretation of the Bible was the mainstay for 1600 years prior and it served the Church very well as the foundation for almost all of the Church's doctrinal and philosophical beliefs. Each doctrine came from the literal interpretation of a specific passage of Scripture.[370] It was only when science tried to call the Church's bluff, as it were, and falsely claimed to have proof of its cosmological theories, or perhaps thought that it had proof when it was only misinterpreting its own scientific evidence, that the climate began to change quite drastically.

In addition, the idea that a "majority of theologians did not recognize the formal distinction between Sacred Scripture and its interpretation" is a statement with little basis in fact. For such a serious indictment against the exegetes of the 1600s we would expect at least some examples from the papal speech beside the question-begging assertion that their consensual belief in heliocentrism serves as evidence. As even one of the members of the commission, Fr. George Coyne, admitted:

> It is, furthermore, claimed in the Papal address that the error of the theologians was due to their failure to "recognize the

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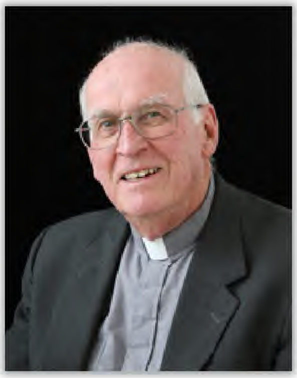
[370] *e.g.*, Baptism – John 3:5; Confession – John 20:23; Eucharist and Mass – Matthew 26:26; John 6:54; Marriage and Divorce – Matthew 19:3-9; Extreme Unction – James 5:14, *etc*.

> distinction between Sacred Scripture and its interpretation." This cannot be correct.
>
> Since the time of Augustine, this distinction was well established and it was taught in all the schools of exegesis at the time of Galileo. In fact, in 1616 the qualifiers/consultors of the Holy Office knew this distinction and made use of it in formulating their philosophical-theological opinion on Copernicanism.[371]



Father George Coyne

It must also be pointed out that it was not merely "theologians" of the day who were teaching that the Earth's position and immobility was part of the Scriptural revelation. It was mainly the popes and cardinals of the 1600s and 1700s. Bellarmine himself said: "Nor can one answer that this [geocentrism] is not a matter of faith." Paul V assembled eleven cardinals who condemned the Copernicanism of Fr. Foscarini in 1615 as being "formally heretical," and issued an injunction to Galileo never to teach heliocentrism again. Pope Urban VIII argued profusely with Galileo on the basis that heliocentrism was "opposed to Scripture" and finally decreed through his Holy Office that belief in the non-movement of the sun around the Earth was "formally heretical," and by doing so made heliocentrism a belief that was against the faith.[372] How could Urban VIII allow such a statement unless he believed that Copernicanism was an impossibility? Indeed, it was these very prelates who made the determination that Scripture had the final say on this particular issue of cosmology, not merely a pre-eminent say. As one can plainly see, this issue was not, by any stretch of the imagination, merely left to "theologians" to debate. Unfortunately, the 1992 papal speech treats these popes and cardinals almost as if they were uninvolved bystanders who were duped by "theologians" (who are also unnamed), most of whom are categorized as those who knew very little about proper biblical exegesis. In fact, in the statement following (see below), the speech attempts to exonerate "Robert Bellarmine" from the error of these "theologians," but history shows that Bellarmine was Galileo's most ardent antagonist, basing his argument on the fact that Scripture had the final say. Quoting Fr. Coyne again:

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[371] "The Church's Most Recent Attempt to Dispell the Galileo Myth," p. 344.

[372] From final 1633 sentence against Galileo: "Che il sole sia centro del mondo et immobile di moto locale, è propositione assurda e falsa in filosofia, e formalmente heretica, per essere espressamente contraria alla Sacra Scrittura" ("The proposition that the sun is the center of the world and does not move from its place is absurd and false philosophically and formally heretical, because it is expressly contrary to the Holy Scripture"), as cited in *Galileo E L'Inquisizione*,

> The "theologians" in both discourses are unidentified and unidentifiable. There is no mention of the Congregation of the Holy Office, of the Roman Inquisition or of the Congregation of the Index, nor of an injunction given to Galileo in 1616 nor of the abjuration required of him in 1633 by official organs of the Church. Nor is mention made of Paul V or Urban VIII, the ones ultimately responsible for the activities of those official institutions.[373]

One can only assume that the 1992 speech's lack of mention of these authoritative arms of the Church was deliberate. Whatever the reasons, the fact remains that without a formal mention and formal disavowal of past authoritative decisions, nothing has changed, at least in the official sense. The most that can be said, perhaps, is that the Church is implying that it has given an unofficial toleration of heliocentrism without giving any official endorsement. In retrospect, we can see why Fr. Coyne and his colleagues, who are avowed heliocentrists, are quite miffed by the papal speech and view it as a failure. Here, after more than ten years of study by a papal commission, the only concrete result is a short, non-authoritative

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Antonio Favaro, 1907, p. 143; and *Le Opere di Galileo Galilei*, Antonio Favaro, p. 403.

[373] "The Church's Most Recent Attempt to Dispell the Galileo Myth," in *The Church and Galileo*, p. 354. Coyne's reference to "both discourses" refers to Poupard's "Address at the Conclusion of the Proceedings of the Pontifical Study Commission on the Ptolemaic-Copernican Controversy in the 16th and 17th Centuries," Origins 22 (Nov. 12, 1992), pp. 370-375 in English, with the original in Après Galilée (Paris: Desclée de Brouwer, 1994), pp. 93-97, and the actual address given by Pope John Paul II. Both speeches were given on October 31, 1992, with Poupard's preceeding the Pope's.

speech addressed to a small body of scholars; a speech that contains no formal retractions or condemnations of any of the actions taken by the seventeenth prelature against Galileo. All that the speech really does is attempt to give a rationale for why the two sides disagreed. Even then the speech has its own distortions and obfuscations, as we have seen thus far.

> **Papal Speech**: In fact, as Cardinal Poupard has recalled, Robert Bellarmine, who had seen what was truly at stake in the debate personally felt that, in the face of possible scientific proofs that the earth orbited round the sun, one should "interpret with great circumspection" every biblical passage which seems to affirm that the earth is immobile and "say that we do not understand, rather than affirm that what has been demonstrated is false."(4) Before Bellarmine, this same wisdom and same respect for the divine Word guided St Augustine when he wrote: "If it happens that the authority of Sacred Scripture is set in opposition to clear and certain reasoning, this must mean that the person who interprets Scripture does not understand it correctly. It is not the meaning of Scripture which is opposed to the truth but the meaning which he has wanted to give to it. That which is opposed to Scripture is not what is in Scripture but what he has placed there himself, believing that this is what Scripture meant."(5) A century ago, Pope Leo XIII echoed this advice in his Encyclical Providentissimus Deus: "Truth cannot contradict truth and we may be sure that some mistake has been made either in the interpretation of the sacred words, or in the polemical discussion itself."(6)

Analysis: Fr. Coyne, a member of the commission, shows the flaws and inaccuracies of the above paragraph in his following words:

> Note that the epistemic priority is given here to Scripture. Since Galileo had no irrefutable proofs of Copernicanism, the current interpretation of Scripture by theologians, including Bellarmine, should remain, but always subject to reinterpretation. Is this a correct presentation of Bellarmine's position?
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> The final report interprets Bellarmine as saying: "As long as there are no proofs for the movement of the Earth about the Sun, it is necessary to be cautious in interpreting Scripture." What Bellarmine actually says is: "Should proofs be had, then we must go back and reinterpret Scripture." The difference is: Bellarmine did not say: "Theologians should be cautious now in interpreting

Scripture in expectation that proofs for Copernicanism might appear" but rather: "If a proof were to appear, then on that day in the future theologians would have to be cautious in interpreting Scripture."

This interpretation of Bellarmine's position, in both the final report and in the Papal address, is based on a partial and selective reading of the *Letter to Foscarini*. In the passage immediately preceding the one just cited, Bellarmine had taken a very restrictive position by stating that:

> Nor can one answer that this [geocentrism] is not a matter of faith, since if it is not a matter of faith 'as regards the topic,' it is a matter of faith 'as regards the speaker'; and so it would be heretical to say that Abraham did not have two children and Jacob twelve, as well as to say that Christ was not born of a virgin, because both are said by the Holy Spirit through the mouth of the prophets and the apostles.

Clearly if geocentrism is a matter of faith "as regards the speaker," then openness to scientific results and circumspection in interpreting Scripture are simply ploys. They lead nowhere. Furthermore, Bellarmine cites Scripture itself in the person of Solomon to show that proofs for Copernicanism are very unlikely. And still more, at the end of the *Letter to Foscarini* Bellarmine appears to exclude any possibility of a proof by stating that our senses clearly show us that the sun moves and that the earth stands still, just as someone on a ship "sees clearly" that it is the ship that is moving and not the shoreline. Both discourses [Poupard's and the Pope's] cite Bellarmine's statement: [374]

> I say that if there were a true demonstration [of Copernicanism] then one would have to proceed with great care in explaining the Scriptures that appear contrary and say rather that we do not understand them, rather than that what is demonstrated is false.

What they do not cite is the next sentence of Bellarmine: "But I will not believe that there is such a demonstration until it is shown to me." From the concluding sentences of the letter it is clear that Bellarmine was convinced that there could be no such

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[374] "The Church's Most Recent Attempt to Dispell the Galileo Myth," in *The Church and Galileo*, pp. 345-346.

> demonstration. A further indication of this conviction is that Bellarmine supported the Decree of the Congregation of the Index which was aimed at excluding any reconciliation of Copernicanism with Scripture….And why did he agree to deliver the injunction to Galileo in 1616? This injunction prohibited Galileo from pursuing his research as regards Copernicanism. Galileo was forbidden to seek precisely those scientific demonstrations which, according to Bellarmine, would have driven theologians back to reinterpret Scripture.[375]
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> **Papal Speech**: Cardinal Poupard has also reminded us that the sentence of 1633 was not irreformable, and that the debate which had not ceased to evolve thereafter, was closed in 1820 with the imprimatur given to the work of Canon Settele.(7)

Analysis: An imprimatur, which is on a much lesser level of authority than the sentence issued by Pope Urban VIII in 1633, cannot "close the debate." This is especially true in light of the fact that Galileo, Copernicus and Kepler's books were left on the *Index of Forbidden Books* after Settele was given his imprimatur in 1822. Technically, the matter can only be closed if a pope or council issues an infallible decree and declares that no more debate will be heard. For example, up until the Council of Trent, there were continuing debates concerning the canon of Scripture. From Jerome, to Pope Gregory the Great, to Cardinal Cajetan, various doubts about the canon were voiced even though previous popes and councils had issued authoritative decrees (*e.g.*, Pope Damascene, Council of Florence). It was only at Trent that a formal infallible decree, accompanied with an admonition that all debate on the canon must cease, did the debate finally come to an end.

As to whether the decrees and sentences of 1616 and 1633 were "not irreformable," Fr. Coyne makes an insightful remark:

> So far as we can conclude from the circumstances of the condemnation, Pope Urban VIII and the cardinals of the Holy Office certainly did not themselves think it to be "reformable." Furthermore, if it was reformable, why has the condemnation of 1633 or, for that matter, the Decree of the Congregation of the Index in 1616 never explicitly been "reformed."[376]

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[375] "The Church's Most Recent Attempt to Dispell the Galileo Myth," in *The Church and Galileo*, pp. 345-346.

[376] *The Church and Galileo*, p. 354. Coyne adds: "In the Galileo case the historical facts are that further research into the Copernican system was forbidden by the

Coyne's logic is sound. It is one thing for Poupard to claim that the 1616 and 1633 decisions were "not irreformable," but the revealing of this pertinent fact of canon law actually turns out to be an admission from Poupard that the Catholic Church has never reformed the seventeenth century decisions. This is just another testimony to the divine protection that has been given to the Church's teaching. Ernan McMullin, although personally endorsing Galileo and his cosmology, likewise admits:

> And let there be no mistake, the judgment of the qualifiers in 1616 and the language of the decree supported by it *were* couched in definitive terms; it was not proposed as something "reformable," to use a term favored by some recent theologians. The decree did not say that in the absence of a demonstration, maintaining the Copernican theses would be risky ("temerarious"). It described the theses as "contrary to Scripture," period, just as the qualifiers had "qualified" the heliocentric claim as "formally heretical."[377]

This is precisely why, as we will see later, that Bellarmine expected no proof for heliocentrism to arise in the future, and why the ecclesiastical argument against Galileo was never really based on whether proof existed. The Church depended on an *a priori* argument that could not be toppled. She drew her line in the sand long before scientific proof became part of the discussion. Galileo knew this to be the case:

> …for in disputes about natural phenomenon they seem to claim the right to force others by means of authority of Scripture to follow the opinion they think is most in accordance with its statements, and at the same time they believe they are not obliged to answer observations and reasons to the contrary.[378]

> …to have such knowledge and demonstration. When one is in possession of this, since it too is a gift from God, one must apply

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decree of 1616 and then condemned in 1633 by official organs of the Church with the approbation of the reigning pontiffs" (*ibid*).

[377] "The Church's Ban on Copernicanism," in *The Church and Galileo*, p. 159.

[378] "…mentre sento che essi pretendono di poter costringer altri, con l' autorità della Scrittura, a seguire in dispute naturali quella opinione che pare a loro che più consuoni con I luoghi di qualla, stimandosi insieme di non essere in obbligo di solvere le ragioni o esperienze in contrario" (*Le Opere di Galileo Galilei*, vol. 5, pp. 323-324, translated by Finocchiaro).

> it to the investigation of the true meanings of the Holy Writ as those places which seem to read differently.[379]

But, of course, Galileo was not in "possession" of such "knowledge and demonstration." At best his evidence was circumstantial; at worst it was a mere bluff from things he knew provided no proof, despite his claims that such items were a "gift of God." There was really nothing else to say. Galileo's claims were contrary to Scripture, case closed. Scripture was not going to change. The only thing that could change was Galileo, which he eventually did, forcefully in 1633 and voluntarily in 1641.[380] As McMullin notes:

> The issue was primarily an exegetical one. Should the disputed passages be understood as being accommodated to the capacity of the hearers, as the defenders of Copernicus suggested? That this was the key question was clearly grasped in Rome well before the Copernican issue came before the Holy Office for formal decision.[381]

Canon Giuseppe Settele's Imprimatur

As for the 1822 imprimatur to Settele, it certainly made no formal and official reform of the 1616, 1633, 1664 decrees, and it is obvious that the 1992 papal speech did not do so either. Indeed, instances in Church history in which a later pope formally and officially changed an authoritative decree and sentence given by a previous pope and his Holy Office would be extremely rare, and, may have never occurred in the history of the Church.

Even more significant is that little known facts concerning the 1822 procedure do not raise Settele's imprimatur to any kind of definitive reform of the 1616-1633 decrees. Fr. Coyne explains why, and his analysis is most intriguing since it suggests that the Holy Office of 1820-22 was not being as forthright about this issue as it should have been:

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[379] *Le Opere di Galileo Galilei*, vol. 5, p. 322.

[380] Galileo was well aware of this dimension of the contention between himself and the Church. In a June 8, 1624 letter to Federico Cesi (one of the censors later assigned by Riccardi to edit Galileo's *Dialogo*) he remarks: "…ma che non era da temere che alcuno fosse mai per dimostrarla necessariamente vera" ("that it was not to be feared that anyone would ever be able to demonstrate it as necessarily true") in *Le Opere di Galileo Galilei*, vol. 13, p. 182.

[381] "The Church's Ban on Copernicanism," in *The Church and Galileo*, pp. 172-173.

The judgment rendered in the final report that "the sentence of 1633 was not irreformable" is accepted in the Papal address. In both discourses [Poupard's and the Pope's] there is an attempt to establish that a reformation actually started as soon as the scientific evidence for Copernicanism began to appear. It is claimed that the reform was completed with the *imprimatur* granted under Pope Pius VII to the book of Canon Settele, *Elements of Optics and Astronomy* in 1822, in which Copernicanism was presented as a thesis and no longer as a mere hypothesis.[382] There are a number of inaccuracies of historical fact and interpretation in these judgments.

The *imprimatur* of 1822 did not refer to Galileo or to the sentence of 1633. It referred to the teachings of Copernicanism. And if it is claimed that the *imprimatur* implicitly reformed the sentence of 1633, why was it not made explicit? As a matter of fact, the works of Copernicus and Galileo remained on the Index until 1835, more than a decade after the Settele affair. And since the sentence of 1633 refers explicitly to Galileo's failure to observe the decree of 1616, why was that decree not also reformed? Of course, if the tactical maneuver of the Commissary of the Holy Office, Olivieri, for granting the imprimatur to Settele's book were to be accepted, then the decree of 1616 and the sentence of 1633 would have been fully justified. At the recommendation of the cardinals of the Holy Office, in order to resolve the issue and to "safeguard the good name of the Holy See," Olivieri devised the following formula. Copernicus was not correct, since he observed circular orbits and epicycles. The Church was, therefore, justified on scientific grounds to condemn Copernicanism in 1616 and 1633. Obviously, there was no need to revoke a decree which rejected what was incorrect at the time of the decree! It appears, from the diaries of Settele, that Olivieri himself had some doubts about his argumentation. Considering all of these circumstances, the resolution of the

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[382] Here Coyne adds a footnote: "Paolo Maffei, *Giuseppe Settele, il suo diario e la questione galileiana* ["Giuseppe Settele: His Diary on the Galileo Question"] (Foligno: Edizione dell'Arquata, 1987), shows that, although the imprimatur to Settele's book was a *de facto* recognition of Copernicanism, it did not refer at all to the Galileo affair. He furthermore shows that Settele had hoped that his case would have brought the Church to reconsider that affair."

> Settele affair can hardly be considered a definitive reform of the sentence of 1633.[383]

Fantoli agrees with Coyne's assessment:

> Father Grandi….Working in agreement with Olivieri…had tried to realize the objective of saving the good name of the Holy See, substantially by emphasizing the fact that the Copernican system, by then recognized even by Catholic authors, had been purified from errors and inconsistencies which made it unacceptable in its original form. This was equivalent to maintaining that the Church had not erred in 1616 by putting on the *Index* a work at that time so defective at the level of physics and that now the Church was legitimately authorized to approve it after its errors were corrected…. That is, the Church had been right in condemning the latter from a scientific point of view, because Galileo had also upheld heliocentrism in its unsatisfactory Copernican form and, moreover, he had not been able to give convincing proofs of heliocentrism.[384]

Finocchiaro sees the same exaggerations and inconsistencies in Poupard's analysis of the situation. Commenting on Poupard's 1992 article in *L'Osservatore Romano* titled "Galileo Case Is Resolved,"[385] Finocchiaro observes the following:

> Poupard says that "in 1741, in the face of the optical proof of the fact that the earth revolves round the sun, Benedict XIV had the Holy Office grant an imprimatur to the first edition of the *Complete Works of Galileo*," however, the rationale underlying the imprimatur for Galileo's *Dialogue* was the plan to change its geokinetic language from categorical to hypothetical; hence this imprimatur was not, as Poupard goes on to say in the next paragraph, an "implicit reform of the 1633 sentence," but rather a kind of reaffirmation of it, "correcting" the *Dialogue* in the way that the Index's decree of 1620 "corrected" Copernicus's book. Poupard also says that "this implicit reform of the 1633 sentence became explicit in the decree of the Sacred

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[383] "The Church's Most Recent Attempt to Dispell the Galileo Myth," in *The Church and Galileo*, p. 346.

[384] Annibale Fantoli, *Galileo: For Copernicanism and the Church*, p. 520.

[385] Paul Poupard, "Galileo Case Is Resolved," *L'Osservatore Romano*, November 4, 1992, weekly edition in English.

> Congregation of the Index that removed from the 1757 edition of the Catalogue of Forbidden Books works favoring the heliocentric theory," but we have seen that the 1757 decision was still implicit and indirect, so much so that Galileo's *Dialogue* was still left on the *Index* and Settele's *Astronomy* in 1820 could run into difficulties; moreover, the 1757 decision amounted to dropping the clause "all books teaching the earth's motion and sun's immobility" from the Index, and to describe this action as a "decree…that removed…works favoring the heliocentric theory" amounts to a sophistical use of equivocation; for what was being removed was not the listed heliocentric works (which would imply removing Galileo's *Dialogue*, Copernicus's *Revolutions*, *etc*.), but rather the clause "all heliocentric works" (which in fact left those specific works in the Index). Referring to the Settele affair, Poupard asserts that "the unjustly censored author lodged an appeal with Pope Pius VII, from whom in 1822 he received a favorable opinion," and here Poupard's chronology is careless at best, for we have seen that the favorable decision on Settele's personal case came in 1820, although it was indeed in 1822 that the general Inquisition ruling came; however, the 1822 decision was not implemented until the 1835 Index and not in 1846, as Poupard misstates in the next paragraph.[386]

Whatever degree of historical revisionism Poupard is guilty of fostering, the facts reveal Maurizio Benedetto Olivieri certainly had a dilemma on his hands. The Dominican censor, Filippo Anfossi, refused Giuseppe Settele permission "to publish an explicitly Copernican textbook on the grounds that the decree of 1616 and the sentence of 1633 had never been revoked."[387] Anfossi's reasoning hearkens back to what the head of the Congregation of the Index relayed to the French astronomer Joseph Lalande in 1765 when the latter sought to have Galileo's *Dialogo* taken off the Index. Lalande was told that because Galileo's condemnation came under the aegis of a canonical trial, the legal sentence against Galileo had to be revoked first before any consideration to reevaluating the *Dialogo* could be initiated.[388] Consequently, Olivieri's mental machinations went to work. He had to come up with some rationale why the Holy Offices of 1616 and 1633 could appear to condemn something that ultimately turned out to be true, yet still avoid the accusation that they had erred in condemning it. He also had to figure a way of allowing Settele's book pass as a "thesis" and not merely a hypothesis.[389]

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[386] *Retrying Galileo*, p. 426, n. 68.

[387] As worded by Ernan McMullin, editor of *The Church and Galileo*, p. 6.

[388] As noted by Finocchiaro in *Retrying Galileo*, p. 154.

Perhaps Olivieri had a eureka moment when he found his solution, for it surely seemed ingenious. As he envisioned it, the 1616 Holy Office could easily have accomplished the task if it could be said that it declared *only the Copernican version* of heliocentrism erroneous. Since by 1616 Kepler had already introduced elliptical orbits and dispensed with Copernicus' epicycles, Olivieri reasoned that the Holy Office could have condemned Copernicanism as technically erroneous yet still permit a correct form of it (*i.e.*, the form with elliptical orbits instead of epicycles). As Olivieri's rationalization played itself out, he reasoned that the 1822 Holy Office would have no need to revoke the decrees or sentence of the

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[389] "Thesis" is the word used by Fr. Coyne in the above quoted sentence: "…the book of Canon Settele, *Elements of Optics and Astronomy* in 1822, in which Copernicanism was presented as a thesis and no longer as a mere hypothesis." Fantoli concurs, stating: "This volume [Settele's] would teach the Copernican system as a thesis and not just a hypothesis" (*Galileo: For Copernicanism and the Church*, p. 497). In general parlance, a "hypothesis" is a proposition that is merely assumed, with little or no evidence, to serve as the basis for initiating the reasoning process. A "theory" is an explanation that is based on at least some evidence that then leads one to reason out a plausible solution. A "thesis" is a conviction of a certain viewpoint that is put forth in anticipation of objections being weighed against it in order to determine its validity. A thesis is not, however, a physical fact, and thus George Sim Johnston's comment: "the work of Canon Settele, in which Copernicanism was presented as a physical fact and no longer a hypothesis" is stretching the truth just a bit (George Sim Johnston, "The Galileo Affair," Princeton, NJ, Septer Press, nd, p. 8, emphasis added). In any case, the editor, Ernan McMullin makes a comment that should be addressed. He writes: "It took the intervention of the pope, Pius VII, to override Anfossi's logic and to prod the Holy Office to decide (though not to publish their decision) that Copernicanism was no longer theologically objectionable. The decision could be changed, it was argued, because now the heliocentric alternative had been, in effect, demonstrated, so the situation was no longer what it had been for the theologians of 1616 and 1633" (*The Church and Galileo*, p. 6). The problem with McMullin's analysis is that the Church of 1616 was not asking for a "demonstration" of Copernicanism, for there were plenty of ways one could do so, both then and now. But a "demonstation" is nothing more than a workable model. No one has argued that a sun-centered and earth-moving model is unworkable or undemonstrable. Rather, the 1616 Holy Office protested that this very model had not been "irrefutably proven." The crucial difference between demonstration and proof is the hinge upon which this debate rests. Since at most only one of the two models could be correct, the Church was required to adhere to the model of Scripture and Tradition unless it could be proven absolutely that she was wrong in doing so.

1616/1633 Holy Offices because, technically speaking, they were right in condemning Copernicus' defective model.

Along these lines, the response from the Holy Office on September 11, 1822 has one very significant fact worthy of note. The decree states:

> Their Eminences have decreed that, for the time being, now and in future, a license is not to be refused to the Masters of the Sacred Apostolic Palace for the printing and publication of works dealing with the mobility of the earth and the immobility of the sun according to the common opinion of modern astronomers, as long as there are no other contrary indications, on the basis of the decrees of the Sacred Congregation of the Index of 1757 and of this Supreme Holy Office of 1820.[390]

Here the Holy Office refers to the mobility of the Earth as the *communem modernorum astronomorum opinionem* ("the common opinion among modern astronomers"), which shows that the Church still regarded Copernicanism as a mere "opinion" regardless of whether said opinion was held by a majority of astronomers. Hence, it is of no real consequence that Settele's imprimatur would be issued based on whether it was a hypothesis or a thesis or somewhere between the two. "Opinions" are as commonplace as the people who hold them. Moreover, imprimaturs that are issued under false pretenses, as was obviously the case in Olivieri's efforts, certainly cannot catapult an opinion to a place of honor. The effort to bypass the 1633 papal-approved decision that a fixed sun and a moving Earth were "formally heretical" and "erroneous in faith" by claiming that it was only the *particular version* of Copernicanism that was being condemned is one of the most ludicrous and egregious forms of rationalization ever propounded by an ecclesiastical ward. In the final analysis, it does not matter whether the version of heliocentrism is Copernican, Neo-Copernican, Keplerian, Newtonian, *etc.* The 1633 Holy Office's decision stated that any cosmology that claims the sun is fixed or the Earth moves is formally heretical and erroneous in faith.

In regards to issuing imprimaturs under false pretenses, as we will see in more detail later, Galileo was issued an imprimatur in 1631, under very questionable circumstances, for his book *Dialogue on the Two Great*

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[390] "E.mi DD. Decreverunt, non esse a praesenti et futuris pro tempore Magistris Sacri Palatii Apostolici recusandam licentiam pro impressione et publicatione operum tractantium de mobilitate terrae et immobilitate solis iuxta communem modernorum astronomorum opinionem, dummodo nihil aliud obstet, ad formam Decretorum Sacrae Congregationis Indicis anni 1757, et huius Supremae anni 1820" (Antonio Favaro*, Galileo e l'Inquisizione,* pp. 30-31).

World Systems. Before he received the imprimatur he failed to inform the censor that he was given an injunction in 1616 not to write or speak on the subject of heliocentrism. Effectively, this made Galileo's imprimatur null and void. Additionally, the subsequent condemnation of Galileo's book in 1633 by Pope Urban VIII shows that a censor may mistakenly issue an imprimatur assuming that a book contains no heretical teachings, but which, under closer scrutiny, is found not only to contain heresies but those of the "formal" variety, since Urban, through his Holy Office, declared that heliocentrism was "formally heretical."[391]

In the end, it is quite unsettling to see Olivieri and the cardinals who advised him project upon the Holy Office of 1616 such calculating motives in its condemnation of Copernicanism. Perhaps Olivieri's desperate act is an indication of the intense pressure modern science had put on the Church during the 1800s. By this time, Kepler's planetary ellipses and Newton's theories of motion, at least in the way they were being interpreted by mainstream science, were making it very difficult for one to adhere to a geocentric universe. Moreover, the Renaissance, the Enlightenment and the Industrial Revolution were certainly no help in maintaining traditional Catholic beliefs. Additionally, in the aftermath of the 1789 French Revolution, Napoleon had deported Pius VI to Florence, abolished the papal government, and set up a Roman Republic, with his army keeping vigilance. He did the same to Pius VII, deporting him to France in 1810 and not freeing him until 1814. These events may be significant in the Galileo affair, since Napoleon expressed a keen interest in Galileo's trial, which resulted in him confiscating all of the Vatican's records and transporting them to France. The file on Galileo's trail was not returned to the Vatican until 1843, eight years after his book was removed from the Index.[392] Not coincidentally, it was under Pius VII's reign that

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[391] From the final 1633 sentence against Galileo: "Che il sole sia centro del mondo et immobile di moto locale, è propositione assurda e falsa in filosofia, e formalmente heretica, per essere espressamente contraria alla Sacra Scrittura" ("The proposition that the sun is the center of the world and does not move from its place is absurd and false philosophically and formally heretical, because it is expressly contrary to the Holy Scripture"), as cited in *Galileo E L'Inquisizione*, Antonio Favaro, 1907, p. 143. In his Sept. 18, 1632 dialogue with Francesco Niccolini, Pope Urban said: "it was not the first time that books already approved by Inquisitors were then rejected and prohibited here, because this had happened many times" (Finocchiaro, *The Galileo Affair*, p. 235).

[392] As Finocchiaro reports: "The Vatican, however, did not forget the matter. There is evidence that in 1835 it made a further attempt to retrieve the file, but to no avail. Unexpectedly, however, in 1843 it was returned to the Holy See by the nuncio to Vienna, to whom it had been given by Blacas's widow" (*Retrying Galileo*, p. 181). Fantoli adds: "…one part of the processi (trial documents) of the

Olivieri found enough weak spots in the Church's protocol to obtain an imprimatur for Settele's book.

Fr. Coyne continues his intriguing commentary on this episode of the Galileo affair:

> But antecedent to this purported definitive reform there are several intermediate reform movements which the final [Poupard] report addresses. Referring to the discoveries of aberration and parallax, it states that:
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> > The facts were unavoidably clear, and they soon showed the relative character of the sentence passed in 1633. This sentence was not irreformable. In 1741…Benedict XIV had the Holy Office grant an imprimatur to the first edition of the complete works of Galileo…. This implicit reform of the 1633 sentence became explicit in the decree of the Sacred Congregation of the Index which removed from the 1757 edition of the Catalogue of Forbidden Books works favoring the heliocentric theory.[393]
>
> To what extent were the activities of 1741 and 1757 reform decisions? The imprimatur of Benedict XIV was granted under the condition that the stipulations of the Padua Inquisitor, who had requested the imprimatur, be observed. The result was that the publication in 1744 of the "complete works" had to exclude the *Letter to Christina* and the *Letter to Castelli*. Furthermore, the *Dialogue* had to be printed in Volume IV, accompanied by the 1633 sentence and the text of Galileo's abjuration, and it had to contain a preface emphasizing its "hypothetical" character.
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> In 1757 after the Cardinal Prefect of the Congregation of the Index had spoken about the matter with Pope Benedict XIV, a decision was taken at a meeting of the consultors (not the Cardinal members) to omit the general prohibition of Copernican books in the new *Index of Forbidden Books*, to be published in 1758. What was to be admitted and prohibited? In the 1619 edition of the *Index of Forbidden Books*, the first after the 1616 decree, and in subsequent editions there were two categories of prohibitions of Copernican works: *nominatim* (specific works) and general. The edition of 1758 excluded only the general.

Holy Office and of the Inquisition…were lost" (*The Case of Galileo: A Closed Question*? 2012, p. 225).

[393] From Cardinal Poupard's "Address" to the Pontifical Academy of Science on October 31, 1992, no. 3, ¶ 2 and no. 4, ¶ 1.

> Included still were among others: Copernicus' *De Revolutionibus*, Galileo's *Dialogue* and Kepler's *Epitome*.[394]

Now we have reached the watershed and it appears as if Cardinal Poupard was either ignorant of these details; performed only a cursory review of the evidence; or he deliberately obfuscated the facts to make it appear as if the Church had fully condoned Copernicanism and rejected the decisions of the Holy Offices of 1616 and 1633. The gravity of this situation is noted in the fact that Poupard not only gave a speech with false or incomplete information to the Pontifical Academy of Science, he foisted the same distorted evidence upon the pope who then disseminated it to the world. It is Poupard who is responsible for the content since he handed the pope the following statement on October 31, 1992: "…the results of the interdisciplinary enquiry which you asked the Commission to undertake."[395] In reality, no pope of the eighteenth century had "reformed" the seventeenth century decisions. The 1741 and 1757 decisions carried almost identical prohibitions as that found in the last *Index of Prohibited Books* updated by Alexander VII in 1664. Moreover, the 1820 decision (giving an imprimatur to Canon Settele) was based on the duplicity of Olivieri, but even in that case, Galileo and Copernicus were kept on the *Index*.

The 1835 Index of Gregory XVI

This leaves the 1835 Index of Gregory XVI as the last official dealing with Copernicanism. As we noted previously, suspicious activity also occurred during this time. Since the Church made it clear she would not consider removing Copernican cosmology off the *Index* until science could substantiate its case with "irrefutable" proof, lo and behold, a false proof, namely, stellar parallax, suddenly appeared (and hence the equally false claim that heliocentrism was a proven fact). Whether or not this had an influence on Gregory XVI to remove Copernicus' and Galileo's works from the *Index of Forbidden Books* in 1835 is not known, yet some suspect it to be so. Astrophysicist and historian, Owen Gingerich, explains:

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[394] "The Church's Most Recent Attempt to Dispel the Galileo Myth," in *The Church and Galileo*, pp. 346-347. The editor, Ernan McMullin, concurs: "In 1741, Galileo's *Dialogo* received an imprimatur as part of a collected edition of Galileo's works. But there was a catch. It had to be prefaced with a disclaimer…the work was to be regarded as no more than a "mathematical hypothesis." It also had to contain the texts of the sentence and abjuration and had to substitute the "earth's apparent motion" for "the earth's motion" in the marginal postils. It was thus far from a revocation of the 1616 ban on the *Dialogue*; indeed, it effectively changed nothing with regard to the theological status of Copernicanism" (*The Church and Galileo*, pp. 5-6).

[395] From Poupard's "Address," No. 5, ¶ 3, as cited in Coyne, p. 352.

> But, Hooke [says]… "May not the Sun move as Ticho supposes, and that the Planets make their Revolutions about it whilst the Earth stands still, and by its magnetism attracts the Sun and so keeps him moving about it?"[396] There is needed, Hooke declares, an *experimentum crucis* to decide between the Copernican and Tychonic systems, and this he proposed to do with a careful measurement of the annual stellar parallax. I will not describe Hooke's attempt, which used what might well be described as the first major instrumentation set up for a single purpose, but let me merely state that Hooke thought he had confirmed the effect and therefore the Copernican arrangement.
>
> While it soon became apparent that Hooke's handful of observations had not established a convincing annual parallax, further attempts led James Bradley to the discovery of stellar aberration, published in 1728.[397] This phenomenon, easily explained in terms of a moving earth, did not have the historical cachet that the quest for parallax had. Hence, ironically, what persuaded the Catholic Church to take Copernicus' book off the Index was an ultimately false claim for the discovery of an annual stellar parallax. The new edition of the Index appearing in 1835 finally omitted *De Revolutionibus*, three years before a convincing stellar parallax observation was at last published.[398]

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[396] Robert Hooke, "An Attempt to Prove the Motion of the Earth from Observations," (London, 1674), p. 3. Hooke writes: "Whether the Earth move or stand still hath been a problem, that since Copernicus revived it, hath much exercised the Wits of our best modern Astronomers and Philosophers, amongst which notwithstanding there hath not been any one who hath found out a certain manifestation either of the one or the other Doctrine" (cited in *Parallax*, Alan Hirshfeld, p. 144.)

[397] James Bradley, "An account of a new-discovered motion of the fixed stars," *Philosophical Transactions*, 35 (1727–28), 637–61.

[398] Owen Gingerich, at St. Edmunds Public Lecture series, titled: "Empirical Proof and/or Persuasion," March 13, 2003, taken from Pierre-Noël Mayaud, S.J., *La Condamnation des Livres Coperniciens et sa Révocation: á la lumière de documents inédits des Congregation de l'Index et de l'Inquisition*, ["The Condemnation of the Copernicus' Book and its Revocation: In the Light of Documents Edited by the Index of the Inquisition"] Rome: Editrice Pontificia Universita Gregoriana, 1997, no page number.

From Gingerich's source, *La Condamnation des Livres Coperniciens et sa Révocation*, we have evidence that the decision to remove Copernicus and Galileo from the 1835 *Index* seems to have been made under false pretenses. In fact, we might say the pope made the removal under the duress of a scientific forgery – the claim that Bradley discovered stellar parallax almost a hundred years earlier, in 1728, and had already proven the heliocentric system. Since there was no other reason for the Church to address the Copernican issue in 1835, it is more than coincidence that a bogus claim for stellar parallax was being propped up a century later as the missing cog in the cosmic wheel for the Church to cower to the demands of modern astronomy.

But the story is not over. Not only was the 1835 reprieve for Copernicus and Galileo presumptuous in light of the false claims attributed to stellar parallax, three years later (1838) when Friedrich Bessel published the first authenticated stellar parallax, the case for heliocentrism was still not proven, since, obfuscated in the clamor of the new discovery was the unadmitted but undeniable fact that stellar parallax can never prove heliocentrism, since parallax can also be explained equally well from a geocentric model.[399] It is safe to conclude that if Gregory XVI had not been so influenced by false astronomical claims, the Church would have never seen fit to give either Copernicus or Galileo even a tiny pardon. Therefore, the removal from the *Index*, if it was based on the above presumptuous scientific claims, is invalid. (See more detailed analysis of both the 1822 and 1835 decisions later in this book).

As it stands, the debate is far from "closed." Perhaps the only thing closed is the minds of those who believe Galileo was right and the Church was wrong. Not only is Poupard guilty of tendentious treatment of the issue, but so are those who worked with him. A typical example is noted in the position of Bernard Vinaty who wrote an article in the volume edited by Poupard on behalf of the 1983 Galileo commission. Even in the face of the primitive scientific proof Galileo presented to the Church, and the rejection of that evidence by Bellarmine and the Holy Office as highly dubious, Vinaty proposes that Galileo, indeed, proved the Earth was in motion and thus insisted that "it is erroneous to maintain that the decisive proof of Copernicanism came only with the first observation of the annual parallax of a star by the astronomer Friedrich Bessel."[400]

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[399] See Chs. 3, 8 & 12 in Vol. I of *Galileo Was Wrong: The Church Was Right* for a detailed explanation of parallax in both the heliocentric and geocentric models. See CDrom of parallax animations.

[400] Bernard Vinaty, "Galileo and Copernicus," in *Galileo Galilei, 350 anni di storia, 1633-1983*, ed. Paul Poupard, Casale Monferrato: Piemme, 1984, p. 42, as cited in *The Church and Galileo*, p. 187.

> **Papal Speech**: 10. From the beginning of the Age of Enlightenment down to our own day, the Galileo case has been a sort of "myth," in which the image fabricated out of the events was quite far removed from reality. In this perspective, the Galileo case was the symbol of the Church's supposed rejection of scientific progress, or of "dogmatic" obscurantism opposed to the free search for truth. This myth has played a considerable cultural role. It has helped to anchor a number of scientists of good faith in the idea that there was an incompatibility between the spirit of science and its rules of research on the one hand and the Christian faith on the other. A tragic mutual incomprehension has been interpreted as the reflection of a fundamental opposition between science and faith. The clarifications furnished by recent historical studies enable us to state that this sad misunderstanding now belongs to the past.

Analysis: The above plea that the Galileo case was all a big "misunderstanding" between science and faith implies the following unstated premise, *i.e.*, that the members of the papal commission went into their investigations having already accepted the belief that the Earth moves around the sun. Thus, the commission was biased and compromised from the start. Moreover, even though the commission concedes that clerics of the 1600s condemned heliocentrism, the papal speechwriters believe they can politely wiggle out of the dilemma by pleading ignorance for the Church's part in the fiasco. They do so by making a subtle yet profound reference to "recent historical studies" that have supposedly put this "sad misunderstanding in the past." By the phrase "historical studies," the speech writers are referring to historical biblical criticism, which began in earnest in Catholic Scripture studies in the late 1880s and which was cautiously permitted for at least some usage after Pius XII's 1943 encyclical, *Divinio Afflante Spiritu*. Catholic liberals believed Pius XII's encyclical gave them a *carte blanche* approval to deliteralize any portion of Scripture that suited their agenda. In fact, it would be no exaggeration to say that the liberals had been waiting for a little over 300 years (1633 to1943) for the Church to relax the requirements for literal interpretation of Scripture in the wake of the Galileo affair. They were convinced that science had proven the Earth moved and thus there was only one sure-fire and face-saving way to coincide that scientific fact with both Scripture and the seventeenth century Catholic magisterium – (a) the Church must declare literal interpretation of Scripture is no longer required, and (b) Scripture is inspired and inerrant only in matters of salvation. Even the somewhat conservative *Catholic Encyclopedia* of 1910 took as an *a priori* fact that heliocentrism was correct and thus concluded that

> …it is undeniable that the ecclesiastical authorities committed a grave and deplorable error, and sanctioned an altogether false principle as to the proper use of Scripture. Galileo and Foscarini rightly urged that Holy Writ is intended to teach men to go to heaven, not how the heavens go.[401]

Whatever damage would be sustained to the Church's credibility by her relinquishing of the literal interpretation of Holy Writ upon which she had depended for the 1900 years prior was of little consequence in the minds of the liberals who so desperately craved worldly appeasement, especially esteem from the scientific community. As they rationalized the dilemma, relinquishing literal interpretation was a small price to pay to save face for the Church. It was decided the modern Church could label the seventeenth century Church as an entity that employed enthusiastic but ignorant clerics who did not have the privilege of being blessed with our "recent historical studies" in the finer art of biblical interpretation. The truth is, of course, that the modern Church caved into the pressure from the *status quo* of modern science and accepted heliocentrism as a fact, which then led her to believe that she had to redo twenty centuries of traditional biblical interpretation. As even Feyerabend observes:

> It is a pity that the Church of today, frightened by the universal noise made by the scientific wolves, prefers to howl with them instead of trying to teach them some manners.[402]

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[401] Article by John Gerard, *Catholic Encyclopedia*, New York, Robert Appleton Publishing, Vol. VI, p. 344. We note here Gerard's attempt to insulate the popes (Paul V and Urban VIII) from direct involvement in the "deplorable error" as he resorts to the euphemistic and vague wording "ecclesiastical authorities" as the culprits in the affair. This is akin to Cardinal Poupard's use of "the errors of the theologians" that was placed in the address of John Paul II to the Pontifical Academy of Science in 1992.

[402] *Farewell to Reason*, p. 260. He adds that in the scientific community, "…the idea of free and independent research is a chimera." With regard to "scientific knowledge-claims," Feyerabend notes: "…we have seen that even the liberal climate of the modern age has not prevented scientists from demanding the same kind of authority which Bellarmino possessed as a matter of course but exercised with much greater wisdom and grace." Regarding the Church's "howling with the wolves," he adds: "In 1982 Christian Thomas and I organized a seminar at the Federal Institute of Technology in Zürich with the purpose of discussing how the rise of the sciences had influenced the major religions and other traditional forms of thought. What surprised us was the fearful restraint with which Catholic and Protestant theologians treated the matter – there was no criticism either of particular scientific achievements or of the scientific ideology as a whole" (*ibid*).

The Church was warned about the "howling" of "historical criticism" by Pope Leo XIII:

> …. There has arisen, to the great detriment of religion, an inept method, dignified by the name of the "higher criticism," which pretends to judge of the origin, integrity and authority of each Book from internal indications alone. It is clear, on the other hand, that in historical questions, such as the origin and the handing down of writings, the witness of history is of primary importance, and that historical investigation should be made with the utmost care; and that in this matter internal evidence is seldom of great value, except as confirmation. To look upon it in any other light will be to open the door to many evil consequences. It will make the enemies of religion much more bold and confident in attacking and mangling the Sacred Books; and this vaunted "higher criticism" will resolve itself into the reflection of the bias and the prejudice of the critics. It will not throw on the Scripture the light which is sought, or prove of any advantage to doctrine; it will only give rise to disagreement and dissension, those sure notes of error, which the critics in question so plentifully exhibit in their own persons; and seeing that most of them are tainted with false philosophy and rationalism, it must lead to the elimination from the sacred writings of all prophecy and miracle, and of everything else that is outside the natural order.[403]

Although the so-called "compatibility" between science and faith had been reached by accepting a moving Earth and non-literally interpreted Scriptures, true compatibility can only be reached by accepting a non-moving Earth and literally interpreted Scriptures. As Bellarmine wrote:

> In Scripture there are many things which of themselves do not pertain to the faith, that is, which were not written because it is necessary to believe them. But it is necessary to believe them because they were written, as is evident in all the histories of the Old Testament, in the many histories in the Gospel and in the Acts of the Apostles, in the greetings of Paul in his Epistles, and in other such things.[404]

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[403] *Providentissimus Deus*, 1893, ¶17.

[404] *De controversiis*, I, I, 4, 12, as found in Roberto Cardinal Bellarmino, S. J., *Opera omnia*, cited in Blackwell's *Galileo, Bellarmine and the Bible*, p. 32.

But as we have outlined in stark detail in volumes 1 and 2, the movers and shakers of the scientific community have shown their outspoken aversion to the possibility of a non-moving Earth, even in the face of scientific evidence that adequately demonstrates the case. Although the evidence for a central and immobile Earth is just dripping from the data, the science community has ignored, silenced, stifled, and ridiculed such evidence as best as it can. Even the Pontifical Academy of Science has shown that its ears are closed to any suggestion that either evolution or heliocentrism are unproven theories, or that creationism and geocentrism (the "sciences" of Scripture) have any scientific evidence to support them. As noted earlier, it is not the scientific evidence that is in dispute; rather, it is the *interpretation* of that evidence from which Faith and Science often divide. As it stands, among scientists, interpretations of the evidence are always colored by biased philosophical and ideological presuppositions and ill-formed prejudices. For example, we noted in volume 1, when faced with the telescopic evidence that Earth might possibly be in the center of the universe, the renowned astronomer Edwin Hubble was forced by his presuppositions and prejudices to say that such an interpretation of the evidence must be "disregarded," was "unwelcome" and "must be avoided"; it was "intolerable" and a "horror."[405] He quickly devised another theory of the universe just so he would not have to entertain a world with a central and non-moving Earth. Consequently, the scientific ideologues of today have now limited the debate to how the Church can reinterpret the Bible to preserve evolution and heliocentrism rather than encouraging scientists and theologians to give a correct interpretion to the scientific data in order to preserve the literal reading of Scripture.

> **Papal Speech**: 11. From the Galileo affair we can learn a lesson which remains valid in relation to similar situations which occur today and which may occur in the future. In Galileo's time, to depict the world as lacking an absolute physical reference point was, so to speak, inconceivable.

Analysis: As volumes 1 and 2 of our work has shown, we have learned that a universe with an absolute reference point is "inconceivable" to the modern scientific community. Hubble told us it was "intolerable" to have the Earth in the center of the universe. Einstein's biographers said that it was "unthinkable" to conceive of the Earth not being in motion, and many other examples from Sagan to Hawking to Ellis were cited to show that the scientific community not only advocates no absolute reference point, it has an absolute aversion to doing so. Every experiment from Arago, Fresnel, Fizeau, Airy, Michelson-Morley, Miller, *etc*., could have been interpreted very easily as a *bona fide* demonstration of a motionless Earth, but science refused to do so and it ended up having to change the very fundamentals of physics to accommodate their own stubbornness. The reason is very simple. Modern science knows that if it admits to an absolute reference point or that Earth is motionless in the center of the universe, this could not have happened by chance. *Someone* would have had to place it there. They have all admitted it. This is no secret. But it is, indeed, a horrible thought to an atheist or an agnostic. It takes away any excuse he has for denying the existence of God, and most men simply will not accept being trapped in such a proverbial corner.

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[405] "Therefore we disregard this possibility….the unwelcome position of a favored location must be avoided at all costs....such a favored position is intolerable...Therefore, in order to restore homogeneity, and to escape the horror of a unique position…must be compensated by spatial curvature. There seems to be no other escape" (*The Observational Approach to Cosmology*, Clarendon Press, 1937, pp. 50, 51, 58).

> **Papal Speech**: And since the cosmos, as it was then known, was contained within the solar system alone, this reference point could only be situated in the earth or in the sun. Today, after Einstein and within the perspective of contemporary cosmology neither of these two reference points has the importance they once had. This observation, it goes without saying, is not directed against the validity of Galileo's position in the debate; it is only meant to show that often, beyond two partial and contrasting perceptions, there exists a wider perception which includes them and goes beyond both of them.

Analysis: As we noted in Volume 1, what most people do not know and what modern science is not willing to admit to them is that Einstein's theory was invented precisely to counter dozens of experiments performed in the 1800s and 1900s that, under then accepted scientific principles, clearly demonstrated the Earth was motionless in space. In other words, the experimental evidence could just as easily be interpreted to be against Einstein's theory and for geocentrism. The science community did everything it could to cover up this fact. The choice became clear: Einstein or the Church; Relativity or Scripture. One said everything was moving, the other said one object was motionless. One said matter shrinks, mass increases and time slows down; the other said nothing has changed and never will; the Earth is fixed and will remain so. The only significant thing that Einstein added to the debate was, ironically, to take the foundation out of heliocentrism, since in Einstein's theory it is just as correct to say the sun revolves around the Earth as it is to say the Earth revolves around the sun, and therefore geocentrism can never be discredited. Hence, the very answer that modern science invented in order to save itself from geocentrism is the very theory that allows geocentrism in as the best alternative.

> **Papal Speech**: 12. Another lesson which we can draw is that the different branches of knowledge call for different methods. Thanks to his intuition as a brilliant physicist and by relying on different arguments, Galileo, who practically invented the experimental method, understood why only the sun could function as the center of the world, as it was then known, that is to say, as a planetary system.

Analysis: Whether Galileo was a "brilliant physicist" is debatable. The arguments (*e.g.*, the tides) he presented to the pope and the Holy Office to prove the Earth was rotating even he knew were specious. Other claims, such as the four moons circling Jupiter that he is purported to have discovered, do not prove heliocentrism. The circling moons only prove that the center of mass of that system is situated closer to Jupiter than it is to the four moons. But there is no proof from Galileo, or anyone else, that the Earth cannot serve as the center of mass for the universe. Modern science has shown us by its own mathematics that such a model is highly possible, and it would be the only such instance, since there can be only one center of mass for the whole universe. This location would make Earth the unique place that Scripture indicates it is, but an "unthinkable" alternative for modern science.

> **Papal Speech**: The error of the theologians of the time, when they maintained the centrality of the earth, was to think that our understanding of the physical world's structure was, in some way, imposed by the literal sense of Sacred Scripture.[406]

Analysis: This is the most problematic sentence in the entire speech. As we noted previously from remarks made by Fr. Coyne (a member of the 1981 Galileo commission for science and epistemology), the speech makes a deliberate attempt to blame the entire matter on nameless "theologians" of the past. Five times the speech refers to these unidentified "theologians" as the cause of the problem, as if there was some tremendous difference between what the theologians were teaching and what the magisterium was upholding. In reality, there was no disagreement; and the mere attempt to make a distinction cast a long shadow on the papal speech. The Catholic magisterium put its full weight behind the condemnation of Copernicus, Foscarini, Galileo, Kepler and any other would-be cosmologist that invented an alternate model to overturn geocentrism. Galileo was told directly by Pope Urban VIII in 1633 that his opinion that the Earth moved around the sun was "an absurd proposition and false in philosophy and formally heretical," to the point that he sought the Grand Duke of Tuscany to help him silence Galileo.[407] In 1616, Pope Paul V was heavily involved in creating the canonical injunction forbidding Galileo to speak or write about Copernicanism. His papal commission of eleven cardinals found that heliocentrism was "a proposition that was absurd in philosophy and formally heretical, which contradicts the express meaning of Sacred Scripture in many places."[408] Every pope thereafter, barring incidents of clerical chicanery in 1820, made the same or similar requirements, and no pope ever made a formal and official reversal of the condemnation of either Copernicanism or Galileo. If anything, the "theologians" were a secondary part of the whole process, since they had no authority, save by the pope and his Holy Office, to force their will on Galileo. It is absolutely unconscionable that the 1992 papal speech tried to pass this problem off on wayward "theologians" who supposedly imposed some unheard of hermeneutic on Scripture.

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[406] Italian original: L'errore dei teologi del tempo, nel sostenere la centralità della terra, fu quello di pensare che la nostra conoscenza della struttura del mondo fisico fosse, in certo qual modo, imposta dal senso letterale della S. Scrittura.

As for the comment that it was an "error" for these theologians to believe that "Scripture imposed itself on the structure of the physical world," far from exonerating Cardinal Bellarmine as the papal speech attempted to do earlier, it has inadvertently derogated him as a blundering fool for having ever confronted Galileo with the argument that a moving

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[407] The 1633 sentence against Galileo stated that heliocentrism was: è propositione assurda e falsa in filosofia, e formalmente heretica ("an absurd proposition and false in philosophy and formally heretical") cited in *Galileo E L'Inquisizione*, Favaro, p. 143. As we will see later, Maurice Finocchiaro's *The Galileo Affair* has one of the better confirmations of Urban's appeal. In the chapter titled "Diplomatic Correspondence 1632-1633" he shows that the bulk of the correspondence was between Pope Urban VIII and the ambassador to the Duke of Tuscany, Francesco Niccolini, detailing Urban's outright rejection of Galileo's assault on "Holy Scripture, religion, and Faith," wherein Urban implored the Duke to help in "shielding Catholicism from any danger" because "this work of his is indeed pernicious, and the matter more serious than his Highness thinks" (*ibid.*, pp. 232, 235, 236, quotes taken directly from Urban VIII as recorded in *Le Opere di Galileo Galilei*, vol. 14, pp. 388-393).

[408] "…dictum propositionem esse stultam et absurdam in philosophia, et formaliter haereticam, quatenus contradicit expresse sententiis Sacrae Scripturae in multis locis…" (*Le Opere di Galileo Galilei*, Favaro, vol. 19, p. 321).

Earth was "opposed to Scripture." The popes who endorsed Bellarmine's hermeneutic were also in error for not stopping Bellarmine from using such a fallacious argument. In fact, the Church for a dozen decades and counting was likewise totally deceived into thinking that literal interpretation was the right approach to Scripture and it should have realized that, perhaps, Galileo was sent from heaven, as it were, to tell them they had it all wrong. In fact, the whole Church, from the time of the Fathers onward for 1500 years had it all wrong because they mistakenly believed in a literal interpretation of Scripture and that cosmology could not be "opposed to Scripture." How is it that such a pernicious and damnable "error" could have ever entered the Church so many centuries earlier and yet not be realized until some genius presented a specious argument that the tides could only be caused by a rotating Earth? How is it that not until two hundred years after Galileo's "evidence," the Church, which is supposed to be led by the Holy Spirit, did not even catch its own "error" until it decided to grant an imprimatur in 1820 to a Canon who whose censor cooked the books in favor of Copernicus but forgot to take him off the *Index*? How is it possible that the hermeneutic of accepting what was "imposed by the literal sense of Sacred Scripture," which worked so well in recognizing doctrines such as the Holy Eucharist ("This is my body") and Baptismal Regeneration ("Unless a man be born of water") and many other precious distillations from Sacred Scripture, could suddenly become so erroneous a methodology when applied to celestial motion that the modern Church finds itself constantly wringing its hands over the past and feels compelled to introduce new fangled interpretive schemas that have virtually destroyed the Church from within? For the 1981 papal commission to use such weak and illogical arguments to save face for themselves is indeed a travesty. They should be hiding their heads in shame.

For those who believe that the Church of the seventeenth century erred in the Galileo case, they need to ask themselves one very important and logical question: Is it the case that the Congregation of the Holy Office, which was put in place by Paul III one hundred years earlier to protect the Church from error, is the very institution that itself falls into error; which falls headlong into one of the most serious blunders ever committed in human history concerning one of the most fundamental of tasks given to the Church – the interpretation of Scripture? How is that possible?

Additionally, if the seventeenth century Church was wrong about the interpretation of Scripture, then, although the 1992 papal speech attempts to deflect blame off the magisterium by such calculated phrases as "the error of the theologians," is this not itself an error for failing to put the blame squarely where it should be – on the very popes and cardinals who authorized it with the full weight of their magisterial offices? In effect, one falsehood (the error of the Inquisition against Galileo) has led to a second falsehood (the papal speech's failure to expose the true perpetrators). Consequently, the very institution the modern Church sought to protect is the very institution that it destroys.

The only solution is for the modern Church to admit that the seventeenth century Church was correct, and the same Church is required to make it an officially recognized fact for the rest of the Church's faithful. Otherwise, both the seventeenth century Church and the twenty-first century Church will be in error, and, unfortunately, barely able to be trusted again with anything short of clear and unequivocal infallible declarations of doctrine on any subject it touches.

A Closer Look at the So-Called "Error of the Theologians"

Since this statement in the papal speech is so significant, let's take an even closer look at the line of argumentation it presents. First, let's recall that five times in the 1992 papal speech Catholic "theologians" of Galileo's day are criticized for being hermeneutically ignorant; and which, as we noted previously, deliberately leaves out the names of the popes who went happily along with these allegedly wayward theologians. The first four instances are as follows:

> Secondly, the geocentric representation of the world was commonly admitted in the culture of the time as fully agreeing with the teaching of the Bible of which certain expressions, taken literally seemed to affirm geocentrism. The problem posed by theologians of that age was, therefore, that of the compatibility between heliocentrism and Scripture. (p. 247)
>
> Thus the new science, with its methods and the freedom of research which they implied, obliged theologians to examine their own criteria of scriptural interpretation. Most of them did not know how to do so. (p. 248)
>
> Paradoxically, Galileo, a sincere believer, showed himself to be more perceptive in this regard than the theologians who opposed him. (p. 248)
>
> The majority of theologians did not recognize the formal distinction between Sacred Scripture and its interpretation, and this led them unduly to transpose into the realm of the doctrine

> of the faith a question which in fact pertained to scientific investigation. (p. 256)

Lastly, these dull-witted seventeenth century theologians get the ultimate intellectual castigation:

> The error of the theologians of the time, when they maintained the centrality of the earth, was to think that our understanding of the physical world's structure was, in some way, imposed by the literal sense of Sacred Scripture. (p. 280)

First, we should repeat once again, as McMullin notes, the 1992 speech was "prepared for the pope," and the most likely candidate for that authorship would be Cardinal Paul Poupard.[409] Although this deflects some of the responsibility off the pope, it is only logical to assume that the pope must inevitably be accountable for its contents. The Vatican has not specified any official level of authority the speech possesses, so it must be judged by its own merits or demerits. All in all, the speech seems to be worded both to emphasize a distancing of the modern Church from its medieval predecessors, and also an attempt, albeit a poor one, to prevent the Church at large from being indicted for any grave mistakes. Let's see how the speech accomplished these two points.

Besides trying to get the Church off the hook by blaming the Galileo affair on nameless and expendable ecclesiastical underlings, the speech seeks to save the Church at large from outright error by never admitting that the "error of the theologians" in Galileo's day was, in fact, the error of rejecting heliocentrism. Not one word or phrase of the papal speech makes any such concession. The papal speech says that their "error" was in deciding "that our understanding of the physical world's structure was, in some way, imposed by the literal sense of Sacred Scripture." Notice the sentence does not say that we cannot interpret Scripture's cosmological passages literally. In fact, it could be concluded that the speech's use of the clause, "imposed by the literal sense of Sacred Scripture" shows that modern theologians are admitting that, according to the tradition, the literal sense of Scripture is certainly *imposed* on the reader.

Since such is the case, how can the papal speech then conclude that this "imposition" does not require the reader *to apply* the literal sense of Scripture to the physical world? The reason is, today's Catholic theologians no longer believe Scripture's passages on cosmology are free from error and therefore there is no obligation to apply them to the physical world. For modern theologians, it is academic whether one interprets Scripture's cosmological passages literally or figuratively. In either case, they are not applicable to the physical world because they are not accurate in their accounting of history or science.

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[409] McMullin reveals that the address to the Pontifical Academy of Science was a "speech prepared for the pope" (*The Church and Galileo*, p. 2).

How can they say this? Because after Vatican II, theologians no longer believed that such passages were inspired by the Holy Spirit. They now believe these particular passages were written by human redactors and therefore they contain not only errors but also myths and fiction. The only biblical passages that today's Catholic theologians believe are error-free are those dealing strictly with salvation.

So, we come to the inevitable conclusion: the real reason modern theologians can turn the Galileo affair on its head is because they've already turned Scripture on its head; but they've turned Scripture on its head because they believe science forced them to that position. This chain-reaction process is stated clearly in the papal speech itself, as it says:

> The upset caused by the Copernican system thus demanded epistemological reflection on the biblical sciences, an effort which later would produce abundant fruit in modern exegetical works and which has found sanction and a new stimulus in the Dogmatic Constitution *Dei Verbum* of the Second Vatican Council. (p. 250).

In other words, because they now believe "the Copernican system" has been proven by modern science, this forced them to cease reading the Bible literally and to adopt new theories of biblical transmission and interpretation (such as, the Wellhausen Documentary hypothesis; historical criticism; redaction criticism, form criticism, *etc.*), which then gave a "new stimulus" in how to understand Scripture, which would be very different than what was previously understood in Galileo's day. So, the conclusion of the modern theologians is rather ingenious: *one can interpret Scripture's cosmological passages as literally as one wants, but since we now know from the Copernican revolution that they are not authored by God but are written by mere humans who lived in primitive cultures, then we are under no obligation to apply them to the physical world.*

Hence, when the papal speech refers to "the errors of the theologians" in Galileo's day, it means those theologians, because they were absent the Copernican proofs we have today, fell into the error of believing Scripture's cosmological passages were inspired by the Holy Spirit and were without error. They were not in error for interpreting Scripture's cosmology in the literal sense but for believing that those passages were inspired by the Holy Spirit. Since modern theologians now know better than the theologians of Galileo's day (at least according to their novel interpretations of Vatican II's *Dei Verbum* 11), the issue is not one of interpretation, *per se*, but one concerning whether Scripture intended to teach literal and accurate historical truth. The answer of modern theologians is clearly negative. The answer of the Church in Galileo's time and prior, as even the 1992 papal speech admits, is positive (although the papal speech cleverly tries to deflect blame off the "Church" and place it on Her past "theologians" so as to make it appear that Church is not contradicting herself).

Essentially, the papal speech seeks to take the matter out of the scientific arena and put it squarely in the ecclesiastical/theological. It becomes an *internal* matter concerning Church protocol and is no longer an *external* matter concerning the age-old battle between science and religion. In other words, if past "theologians" can be blamed for not following proper protocol regarding the true nature of Scripture (*i.e.*, that Scripture errs in matters of history and science), the modernists can then, as an internal matter, distance themselves from these medieval theologians and present themselves to modern academia as sophisticated and properly educated theologians who, if they were back in Galileo's day, would have certainly done things very differently. They now can safely assert that there was never a battle between religion and science, since those in the past who sought to apply an errant Scripture to matters of history and science were clearly wrong.

In the end, however, we have a blatant contradiction, and one group of "theologians," the traditional or the modern, is wrong, because both positions: (a) "the Bible's history is without error," and (b) "the Bible's history contains error," cannot be right. Modern theologians believe (b) is right only because they believe modern science has proven heliocentrism correct. This book has shown, however, that heliocentrism has not been proven correct and, in fact, the scientific evidence points to geocentrism as correct and that mainstream scientists have tried to cover up the evidence, and therefore have been lying to the Church. The Church, because it has lost its faith, has accepted the fabrications of science and rejected both Scritpure and tradition.

A Second Possibility

Another possibility for the sentence "The error of the theologians of the time, when they maintained the centrality of the earth, was to think that our understanding of the physical world's structure was, in some way, imposed by the literal sense of Sacred Scripture" is that the literal *sense* of a biblical passage sometimes requires that it not be interpreted literally but metaphorically. For example, when Jesus says in Matthew 5:29: "If your right eye offends you, pluck it out," he is most likely using hyperbole or dramatic language to impress upon us the seriousness of sin but is not asking us to mutilate ourselves. The *literal interpretation* would be that we pluck out our eye. But the *literal sense* is that we avoid sin with the utmost scrupulosity, since the consequences are very grave. Hence, the papal speech could be saying that the "theologians" of Galileo's day erred because they missed the literal *sense* of Scripture's cosmological passages, that is, they missed the fact that the passages were only speaking about *appearances* in the sky, not the actual movements in the sky. Thus, in the case of Joshua 10:10-14, the papal speech may be implying that the seventeenth century theologians erred when they failed to see that Joshua's command for the sun to stop moving was not to be interpreted literally anymore than "If your right eye offends you, pluck it out" is to be interpreted literally.

If that is the meaning of the papal speech, its offense is not a serious as saying that the "theologians" were in error for believing that all Scripture was inspired by the Holy Spirit and completely inerrant, but it is still a fallacious and misleading argument. The only reason one would refrain from plucking out his eye is on the basis of prior revelation concerning how to regard the human body, namely, that Jesus and Scripture forbid self-mutilation.[410] Similarly, the only reason a modernist could insist that Scripture's cosmological passages are referring to *appearance* is that he has some prior knowledge that heliocentrism is correct and thus disallows a literal interpretation of Joshua 10:10-14. But the modernist has no such certain knowledge of heliocentrism. He doesn't, and he never will. Modern theologians can only cultivate a conviction to heliocentrism from certain sectors of modern academia, which also requires that they avoid other sectors that provide alternative interpretations of the scientific data. As we have noted in previous volumes, the scientific data actually gives more evidence of geocentrism than heliocentrism, but most, if not all, modernist theologians have either not been shown the evidence or refuse to engage with it. It is the same reason that the Pontifical Academy of Science (the very institution to whom John Paul II gave his speech on Galileo in 1992) refuses to allow any creation scientists, no matter how credentialed, within its 100-member ranks. They simply refuse to allow alternative scientific data and views into the discussion. It is the same reason that this author has asked many Catholic scientists and theologians to debate the issue of geocentrism but who refuse to do so.

So, the question remains, since the debate between the two is clearly a case of Aristotle's "Principle of Exclusive Disjunction for Contradictions" in which only one can be true and the other is false,[411] one of these two groups is wrong and the other is right. It is the thesis of this book that the modern theologians, and hence a great part of the modern "Church," is wrong. It is wrong about its belief that the Copernican system is correct; it is wrong in its belief that Scripture is in error when it speaks about history; it is wrong in its belief that Scripture is only inerrant when it speaks about salvation; and it is wrong when it says that Scripture is only communicating in phenomenal language when it declares that the sun moves and the Earth is motionless. It seems obvious that once this "Church" drops its belief in Copernicanism, it will also drop its fallacious and non-traditional view of Scripture.

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[410] *Cf.* Lv 19:28; 1Co 6:19-20.

> **Papal Speech**: Let us recall the celebrated saying attributed to Baronius "Spiritu Sancto mentem fuisse nos docere quomodo ad coelum eatur, non quomodo coelum gradiatur."

Analysis: This is the famous statement often translated as: "The Holy Spirit tells us how to go to heaven, not how the heavens go." In some colloquial versions "Holy Scripture" replaces "Holy Spirit." The speech says that it has been "attributed" (original: "attribuita") to Cardinal Baronius because no exact quote exists from Baronius' writings.[412] It is not indicative of any magisterial decree or even an authoritative statement, but a mere cliché that may have been circulating in the pro-Galilean *Accademia die Lincei* circles during the seventeenth century controversy. It has no more weight than any other opinion being propagated at that time, and thus it is quite inapproporiate in a 1992 papal address. Cardinal Poupard's resorting to such specious statements perhaps shows the pressure he was under to provide some plausibility for his assault on the literal interpretation of Scripture.

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[411] As opposed to the Principle of Non-Contradiction in which at most one is true, but both can be false; or the Principle of the Excluded Middle in which at least one is true but both can be true.

[412] Galileo wrote it quite poetically in his native Italian to Madama Cristina di Lorena: "…ciò è l'intenzione dello Spirito Santo essere d'insegnarci come si vadia al cielo, e non come vadia il cielo" ("that is the intention of the Holy Spirit which is to teach us how to go to heaven, and not how the heavens go") and attributes it as coming from "Io qui direi quello che intesi da persona ecclesiastic constituita in eminentissimo grado" ("Here I refer to the understandings of an ecclesiastical person in a very eminent position"), who most suppose is Cardinal Cesare Baronio (*Le Opere di Galileo Galilei*, 1968, vol 5, p. 319, lines 25-28). Stillman Drake claims that "a marginal note by Galileo assigns this epigram to Cardinal Baronius" who "vistited Padua with Cardinal Bellarmine in 1598, and Galileo probably met him at that time" (*Discoveries and Opinions of Galileo*, p. 186).

More to the point, however, is that Baronius' statement is false. No one in the whole history of Catholic Scripture study up to that point had ever uttered such a denial on the domain of either the Holy Spirit's teaching or the content of Holy Writ. Baronius' quip can easily be countered with one that Robert Bellarmine was sure to have thought: "The Holy Spirit tells us how the heavens go, as well as how to get to heaven." Unfortunately, however, the papal speech has made exegetical delinquents of all those of the Church who lived prior to and in the time of Baronius' cliché. If the Bible does not concern itself with "how the heavens go" then why did the Fathers of the Church, in unanimous consent, believe it to be so, and why did Cardinal Bellarmine and his fellow cardinals, with the popes afterwards who for decades sanctioned their verdicts against Galileo, ever dare say that, because it was spoken by the Holy Spirit, a motionless Earth and a moving sun were "a matter of faith"? As we noted in Chapters 14 and 15, celestial motion rotating around an immobile Earth permeates the divine record, from the Pentateuch to the Deuterocanonicals and everything between them.

> **Papal Speech**: In fact, the Bible does not concern itself with the details of the physical world, the understanding of which is the competence of human experience and reasoning. There exist two realms of knowledge, one which has its source in Revelation and one which reason can discover by its own power. To the latter belong especially the experimental sciences and philosophy. The distinction between the two realms of knowledge ought not to be understood as opposition. The two realms are not altogether foreign to each other, they have points of contact. The methodologies proper to each make it possible to bring out different aspects of reality.

Analysis: The veracity of this statement depends on what is meant by "details." It is certainly true that the Bible does not get into the micro world of science, but it does address the macro world quite handily. Of the six days God has given him to labor, it is man's quest to determine how the components of the universal machine work. He can do so once he knows, from divine revelation, the basic macro-structure. If he is wrong on the macro structure, he will either be wrong on the micro structure, or he will amass a numerous amount of details without ever being able to put them together in a unified whole. This has been the failure of man ever since the Enlightenment's rationalism made him think he could amass enough particulars to make his own universals. Modern man found out to his utter dismay that this was an impossible task. The universals must be given to him, and even some details must be added as well, otherwise man will be very confused in his intellectual pursuits. The "human reasoning and experience" to which the speech refers has severe limitations. In fact, the most important thing our reason should tell us is that we can be very wrong in our reasonings about the world if we do not start out with the right foundation. Our reasoning should lead us to realize that we can never figure out everything by our own reason, and thus our reason should lead us to revelation as a guiding help. Reason that seeks help from revelation is the only reasonable option for finite man. Our reason should lead us to ask why Scripture pays such an inordinate amount of attention describing the cosmos. As we noted earlier in Chapter 14, Scripture is so certain about the existence of an immobile Earth that it uses that fact to vouch for God's veracity and faithfulness (Ps 96:9-11). Both are immovable rocks that cannot be disturbed, thus one testifies to the strength of the other.

As for the papal speech's comment that "the latter belong to the experimental sciences and philosophy," it is a fact that scientific experiments can be misinterpreted just as easily as Cardinal Poupard believes the Bible can be misinterpreted. Experimental science is not an end in itself. There is no monolithic consensus of belief among scientists about even the most general of issues. As we noted in volumes 1 and 2, scientists continually fight and disagree with one another over some of the most basic issues. The only thing upon which they all seem to agree is that they want science to be their answer and religion to take a back seat. Modern academia has already made up its mind how it wants to interpret the scientific data and understand the world, and in that particular understanding it has little toleration for the propositions of religion.

> **Papal Speech**: III. 13. Your Academy conducts its work with this outlook. Its principal task is to promote the advancement of knowledge with respect for the legitimate freedom of science(8) which the Apostolic See expressly acknowledges in the statutes of your institution.
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> What is important in a scientific or philosophic theory is above all that it should be true or, at least, seriously and solidly grounded. And the purpose of your Academy is precisely to discern and to make known, in the present state of science and within its proper limits, what can be regarded as an acquired truth or at least as enjoying such a degree of probability that it would be imprudent and unreasonable to reject it. In this way unnecessary conflicts can be avoided.

Analysis: Freedom always assumes responsibility; it requires one to know the boundaries of one's freedom. Science has freedom within the constraints of science, but science does not have the freedom to impose its unproven theories on religion. In fact, science has provided very little proof for its many and varied theories. It has barely scratched the surface in understanding this very complicated world. It is high time for science to cease thinking that it has all the answers to life and the cosmos, or that it will ever attain anything close to complete knowledge on its own. This is why Pius X said the following:

> Human science gains greatly from revelation, for the latter opens out new horizons and makes known sooner other truths of the natural order, and because it opens the true road to investigation and keeps it safe from errors of application and of method. Thus does the lighthouse show many things they otherwise would not see, while it points out the rocks on which the vessel would suffer shipwreck.[413]

The fact is, science continually overturns science, and the overturning always occurs when the previous science was not built on the proper foundation. Like a hurricane coming through a Midwest town, a scientific edifice can be destroyed overnight if it is built on a faulty foundation. Geocentric science, which has only mounted its opposition with sophistication in the last fifty years or so, is on the horizon to overturn anti-geocentric science. The difference between the two camps is that geocentric science has the proper foundation, for it is built on divine revelation, patristic consensus and magisterial authority, all of which coincide with the scientific evidence that is now being discovered on a daily basis. Here, as always, proper interpretation of the scientific data is paramount. When a scientist is confronted with evidence that the Earth is in the center of the universe, he is not permitted to hide his head in the sand like the proverbial ostrich complaining that such a conclusion is "intolerable" and "must be avoided at all costs," as Edwin Hubble did in the 1930s. If he sees evidence from numerous experiments that the Earth may not be moving in space, he cannot dismiss it and claim that such conclusions are "unthinkable," as Albert Einstein did in 1905, developing a whole new and convoluted physics just to avoid the possibility of a fixed Earth. The scientific evidence shows that there is, indeed, a high "degree of probability" that the Earth is central and immobile, but modern academia refuses to listen. It needs the guiding hand of religion to keep it honest, forcing it to interpret the scientific data with integrity, without bias and prejudice against the tenets of religion. At the least, it should offer both possibilities to its students. But that is not what we see today. Modern science has taken the cosmos as its prisoner and will not let anyone register a dissenting opinion in the halls of academia.

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[413] Pope Pius X, encyclical of March 12, 1904, *Iucunda Sane*, 35.

> **Papal Speech**: The seriousness of scientific knowledge will thus be the best contribution that the Academy can make to the exact formulation and solution of the serious problems to which the Church, by virtue of her specific mission, is obliged to pay close attention to problems no longer related merely to astronomy, physics and mathematics, but also to relatively new disciplines such as biology and biogenetics. Many recent scientific discoveries and their possible applications affect man more directly than ever before, his thought and action, to the point of seeming to threaten the very basis of what is human.
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> 14. Humanity has before it two modes of development. The first involves culture, scientific research and technology that is to say whatever falls within the horizontal aspect of man and creation which is growing at an impressive rate. In order that this progress should not remain completely external to man, it presupposes a simultaneous raising of conscience, as well as its actuation. The second mode of development involves what is deepest in the human being, when transcending the world and transcending himself, man turns to the One who is the Creator of all. It is only this vertical direction which can give full meaning to man's being and action, because it situates him in relation to his origin and his end. In this twofold direction, horizontal and vertical, man realizes himself fully as a spiritual being and as homo sapiens. But we see that development is not uniform and linear, and that progress is not always well ordered. This reveals the disorder which affects the human condition. The scientist who is conscious of this twofold development and takes it into account contributes to the restoration of harmony.

Analysis: As we detailed the statistics in Chapter 13 of Volume II, the sad fact is that most of mainstream science does not endorse the "twofold development."

> **Papal Speech**: Those who engage in scientific and technological research admit as the premise of its progress, that the world is not a chaos but a "cosmos" – that is to say, that there exist order and natural laws which can be grasped and examined, and which, for this reason, have a certain affinity with the spirit. Einstein

> used to say: "What is eternally incomprehensible in the world is that it is comprehensible."(9) This intelligibility, attested to by the marvelous discoveries of science and technology, leads us, in the last analysis, to that transcendent and primordial Thought imprinted on all things.

Analysis: As we also detailed in Chapter 13, Einstein did not believe in a personal God, and because of this disbelief his moral life was almost totally bankrupt. Divorce, adultery, child abandonment, plagiarism and other moral deficiencies plagued him his whole life. In addition, we have seen from the scientific evidence that Albert Einstein, when faced with two possible solutions to both Maxwell's equations and the Michelson-Morley experiment, refused to accept the biblical one, which had the Earth motionless in space and kept physical laws the same. Instead, Einstein chose the solution that put the Earth in motion and necessitated a total revamping of physics.

Moreover, the papal speech should be more forthright about Einstein's world. It is hardly "comprehensible." A haunted and uncertain world in which one twin ages faster than the other, where one clock slows down and the other speeds up, where objects shrink and their mass increases when moved, where everybody is in motion and no absolute place exists from which to measure their distances, where up is down and left is right, where mass is energy and force is imaginary. This bizarre menagerie is what is presented as the "comprehensible" world of Albert Einstein, the very world he was required to create in the minds of gullible men in order to keep the Earth moving in space in spite of the scientific evidence that said it was motionless.

> **Papal Speech**: Ladies and gentlemen, in concluding these remarks, I express my best wishes that your research and reflection will help to give our contemporaries useful directions for building a harmonious society in a world more respectful of what is human. I thank you for the service you render to the Holy See, and I ask God to fill you with his gifts.[414]

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[414] Footnotes of the 1992 papal speech: (1) AAS 71 (1979), pp. 1464-1465. (2) Letter of 21 November 1613, in Edizione nazionale delle Opere di Galileo Galilei, dir. A. Favaro, edition of 1968, vol. V, p. 282. (3) Letter to Christine de Lorraine, 1615, in Edizione nazionale delle Opere di Galileo Galilei, dir. A. Favaro, edition of 1968, vol. V, pp. 307-348. (4) Letter to Fr. A. Foscarini 12 April 1615, *cf.* Edizione nazionale delle Opere di Galileo Galilei, dir. A. Favaro, vol. XII, p. 172. (5) Saint Augustine, *Epistula* 143, n. 7 PL 33, col. 588. (6) Leonis XIII Pont. Max. Acta, vol. XIII (-1894), p. 361. *Cf.* Pontificia Academia Scientiarum Copernico, Galilei e la Chiesa. (7) Fine della controversia (1820). Gli atti del Sant'Ufficio, a

Cardinal Joseph Ratzinger (Pope Benedict XVI)
"The Crisis of Faith in Science"[415]

In the last decade, creation's resistance to allowing itself to be manipulated by humanity has emerged as a new element in the overall cultural situation. The question of the limits of science, and the criteria which it must observe, has become unavoidable. Particularly emblematic of this change of intellectual climate, it seems to me, is the different way in which the Galileo case is seen. This episode, which was little considered in the 18th century, was elevated to a myth of the Enlightenment in the century that followed. Galileo appeared as a victim of that medieval obscurantism that endures in the Church. Good and evil were sharply distinguished. On the one hand, we find the Inquisition: a power that incarnates superstition, the adversary of freedom and conscience. On the other, there's natural science represented by Galileo: the force of progress and liberation of humanity from the chains of ignorance that kept it impotent in the face of nature. The star of modernity shines in the dark night of medieval obscurity.

Today, things have changed. According to [Ernst] Bloch, the heliocentric system – just like the geocentric – is based upon presuppositions that can't be empirically demonstrated. Among these, an important role is played by the affirmation of the existence of an absolute space; that's an opinion that, in any event, has been cancelled by the Theory of Relativity. Bloch writes, in his own words: 'From the moment that, with the abolition of the presupposition of an empty and immobile space, movement is no longer produced towards something, but there's only a relative movement of bodies among themselves, and therefore the measurement of that [movement] depends to a great extent on the choice of a body to serve as a point of reference, in this case is it not merely the complexity of calculations that

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cura di W. Brandmuller e E. J. Griepl, Firenze, Olschki, 1992. (8) *Cf.* Second Vatican Ecumenical Council, Pastoral Constitution Gaudium et spes, n. 36, par. 2. (9) In The Journal of the Franklin Institute, vol. 221, n. 3, March 1936.

[415] Extracts taken from "A Turning Point for Europe? The Church and Modernity in the Europe of Upheavals," Paoline Editions, 1992, pp. 76-79. From a speech given on March 15, 1990 in Parma, Italy. English translation by the *National Catholic Register*. http://ncronline.org/node/11541

renders the [geocentric] hypothesis impractical? Then as now, one can suppose the earth to be fixed and the sun as mobile."

Curiously, it was precisely Bloch, with his Romantic Marxism, who was among the first to openly oppose the [Galileo] myth, offering a new interpretation of what happened: The advantage of the heliocentric system over the geocentric, he suggested, does not consist in a greater correspondence to objective truth, but solely in the fact that it offers us greater ease of calculation. To this point, Bloch follows solely a modern conception of natural science. What is surprising, however, is the conclusion he draws: "Once the relativity of movement is taken for granted, an ancient human and Christian system of reference has no right to interference in astronomic calculations and their heliocentric simplification; however, it has the right to remain faithful to its method of preserving the earth in relation to human dignity, and to order the world with regard to what will happen and what has happened in the world."

If both the spheres of conscience are once again clearly distinguished among themselves under their respective methodological profiles, recognizing both their limits and their respective rights, then the synthetic judgment of the agnostic-skeptic philosopher P. Feyerabend appears much more drastic. He writes: "The church at the time of Galileo was much more faithful to reason than Galileo himself, and also took into consideration the ethical and social consequences of Galileo's doctrine. Its verdict against Gaileo was rational and just, and revisionism can be legitimized solely for motives of political opportunism."

From the point of view of the concrete consequences of the turning point Galileo represents, however, C. F. von Weizsacker takes another step forward, when he identifies a "very direct path" that leads from Galileo to the atomic bomb.

To my great surprise, in a recent interview on the Galileo case, I was not asked a question like, 'Why did the Church try to get in the way of the development of modern science?', but rather exactly the opposite, that is: 'Why didn't the church take a more clear position against the disasters that would inevitably follow, once Galileo had opened Pandora's box?'

It would be absurd, on the basis of these affirmations, to construct a hurried apologetics. The faith does not grow from resentment and the rejection of rationality, but from its fundamental affirmation and from being inscribed in a still greater form of reason …

> Here, I wished to recall a symptomatic case that illustrates the extent to which modernity's doubts about itself have grown today in science and technology.

Response: The cardinal, now pope, has courageously recognized one of the theses of the geocentric movement. Not only does he admit that there is no empirical proof for heliocentrism, he realizes that the very foundation of modern science permits and promotes the geocentric universe. The pope's above counter-syllabus, as it were, to the heliocentric system could have been seen, if men's eyes were open, from the very first attempts to prove the heliocentric system during the time of Galileo, namely, stellar parallax, stellar aberration, retrograde motion, and various others. All of these phenomena can be easily explained from the geocentric system and are therefore falsified as proofs for heliocentrism. As the pope discovered when he was a cardinal in 1990, the relative nature of motion precludes any proofs for heliocentrism, since there will always exist a reciprocal motion in the geocentric system.

As we noted earlier, the irony of modern science's quest in the last few hundred years to promote heliocentrism and discredit geocentrism was seen no better than in the efforts of the Master of Relativity, Albert Einstein. Although convinced from his mentors such as Copernicus, Galileo and Newton that the Earth was moving, he was suddenly faced with the surprising results of one of the world's most famous experiments – the 1881 and 1887 Michelson-Morley experiment that demonstrated, by all normal procedures and indications, that the Earth was motionless in space. As Einstein's biographer put it, after the Michelson-Morley experiment…

> The problem which now faced science was considerable. For there seemed to be only three alternatives. The first was that the Earth was standing still, which meant scuttling the whole Copernican theory and was unthinkable.[416]

Following his mentors, Einstein was equally convinced that, because of this upsetting experiment he had to reinvent physics from the bottom up in order to keep the Earth moving. The reinvention, which he borrowed from fellow physicist Henrick Lorentz, was to claim that Michelson's experimental apparatus shrunk during testing and caused the results to be skewed. The shrinking made it appear as if the Earth was motionless in space and not revolving around the sun. Einstein's 'incredible shrinking machine,' as it should be coined, was also required to shrink time and distance in order to make up for any loss of dimensions caused by the shrinking apparatus. Viola! The Special Theory of Relativity was born, a haunted house of mirrors in which nothing would ever be as it actually appeared.

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[416] *Einstein: The Life and Times*, 1984, pp. 109-110.

Consequently, Einstein became the world's most famous scientist not because he was more accomplished than his peers, but mainly because the men of science who had sweated through twenty-five excruciating years of having no answer to Michelson-Morley and were thus on the very precipice of having to admit the Catholic Church was right in condemning all the so-called proofs for heliocentrism, were valiantly saved by the new Moses, as the Jewish author Abraham Pais calls Einstein,[417] when he came down from the mountain in 1905 with the new Laws of Physics to provide the godlike interpretation to the 1881 and 1887 experiments that would save mankind from having to bow the knee to the Catholic Church. Unfortunately, the Catholic Church has never been the same since.

But all was not lost. As Moses was forbidden to go to the Promised Land because he struck the rock twice instead of once (Num 20:11-12), so Einstein was forbidden to ever again deny geocentrism when he struck the Physics rock twice, his next swipe being the General Theory of Relativity in 1915 to make up for the inadequacies of the Special Theory of 1905. In doing so, all his effort to keep the Earth moving with the Special Theory became undone by his General Theory. We might say, by God's doing, Einstein was hoist by his own petard. Whereas the Special Theory could keep the Earth moving but with the cost of having to introduce a relative motion between the sun and the Earth, the General Theory took relative motion to the next level, to the bounds of the universe, and forced Einstein to admit that a rotating universe around a fixed Earth was just as viable as an Earth rotating in a fixed universe. In effect, whereas the Special Theory introduced a relative motion between the sun and the Earth, the General Theory introduced the relative motion between the Earth and the universe, and geocentrism found its most ardent supporter in Albert Einstein:

> Since the time of Copernicus we have known that the Earth rotates on its axis and moves around the sun. Even this simple idea, so clear to everyone, was not left untouched by the advance of science....The struggle, so violent in the early days of science,

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[417] "A new man appears abruptly, the 'suddenly famous Doctor Einstein.' He carries the message of a new order in the universe. He is a new Moses come down from the mountain to bring the law and a new Joshua controlling the motion of heavenly bodies….The new man who appears at that time represents order and power. He becomes the divine man, of the twentieth century" (Abraham Pais, *Subtle is the Lord*, 1982, 2005, p. 311.)

> between the views of Ptolemy and Copernicus would then be quite meaningless. Either coordinate system could be used with equal justification. The two sentences: "the sun is at rest and the Earth moves," or "the sun moves and the Earth is at rest," would simply mean two different conventions concerning two different coordinate systems.[418]

As to how the General Theory brought us right back to the ancients who viewed the turning sky of stars each night as caused by the rotation of the universe around a stationary Earth, Einstein can't help but agree. His theory demands it, both geometrically and dynamically:

> We need not necessarily trace the existence of these centrifugal forces back to an absolute movement of K' [Earth]; we can instead just as well trace them back to the rotational movement of the distant ponderable masses [stars] in relation to K' whereby we treat K' as 'at rest.'…On the other hand, the following important argument speaks for the relativistic perspective. The centrifugal force that works on a body under given conditions is determined by precisely the same natural constants as the action of a gravitational field on the same body (i.e., its mass), in such a way that we have no means to differentiate a 'centrifugal field' from a gravitational field.…This quite substantiates the view that we may regard the rotating system K' as at rest and the centrifugal field as a gravitational field....The kinematic equivalence of two coordinate systems, namely, is not restricted to the case in which the two systems, K [the universe] and K' [the Earth] are in uniform relative translational motion. The equivalence exists just as well from the kinematic standpoint when for example the two systems rotate relative to one another.[419]

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[418] Albert Einstein and Leopold Infeld, *The Evolution of Physics*, 1938, 1966, pp. 154, 212.

[419] Einstein's October 1914 paper titled: "Die formale Grundlage der allgemeinen Relativitätstheorie," trans. by Carl Hoefer, in *Mach's Principle: From Newton's Bucket to Quantum Gravity*, eds. Julian Barbour and Herbert Pfister, pp. 69, 71.

The Church Confronts Copernican Cosmology: 1500-1600

Why is it that the 1992 papal speech could not make an official break with its seventeenth century counterparts, or make a definitive case for Galileo and against geocentrism? Why was the papal speech high on ambiguities and dismissives but weak on answers and authoritative declarations? The reason, as we shall see, was that the predecessors of John Paul II were very direct and authoritative in the opposite vein. It is an inevitable fact of ecclesiastical protocol that the stronger the papal decisions of the past, the more accommodating to them must be those in centuries following. Rest assured, the Catholic Church has never officially declared that its previous popes and cardinals were in error over the Galileo case, and rest assured it never will.

One of the more interesting facts about the Galileo affair is that it was not the first time the Catholic Church confronted someone who wanted to change the traditional cosmology. In fact, considering the numerous episodes of this cosmological contention that occurred prior to Galileo, we might say that by the time Galileo came on the scene the Church was more or less fed up with theologians and mathematicians taking pot shots at geocentrism, and thus the axe finally came down on the unfortunate mathematician from Linceo. As we noted in Volume I, although it is true that Copernicus did not publish his *De revolutionibus* until the year he died (1543), and reportedly allowed Osiander to put a disclaimer on his work indicating that it was hypothetical, like Galileo after him, Copernicus himself did not wish to leave heliocentrism a mere mathematical possibility. His statements to Pope Paul III refer to opponents of heliocentrism as "idle talkers who take it upon themselves to pronounce judgment, although wholly ignorant of mathematics" and he accuses them of "shamelessly distorting the sense of some passage in Holy Writ to suit their purpose, they dare to reprehend and to attack my work."[420] These are not the words of a timid scholar who proposes a mere hypothetical model of the universe to fix the calendar and resign himself to carrying the burden of proof for a new theory; rather, it is someone whose convictions are very strong and who does not appreciate being underminded by those he considers ignorant of the truth and less than his equal.

One of Copernicus' close friends, Georg Joachim Rheticus (a homosexual who eventually severed ties with Copernicus after having been double-crossed by him) was pushing heliocentrism with even more vigor than Copernicus. Where Copernicus showed at least some reluctance to publish his final work, Rheticus greased the wheels by alerting Osiander who quickly fashioned the famous "hypothetical" disclaimer for Copernicus. Rheticus' verve came from his own heliocentric convictions, which he had published two years earlier, in 1541. In it Rheticus attacks what he senses is the prime battle ground of the controversy, assuring his readers that we should see "very clearly…that the motion of the earth does not contradict the Holy Scriptures."[421] He adds:

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[420] Charles Wallis, *On the Revolution of the Heavenly Spheres*, Preface and Dedication to Pope Paul III, p. 7.

> From all this it is plain that it cannot be proved from the sacred writings that the earth is immobile. Therefore, he who assumes its mobility in order to provide a reliable calculation of times and motions is not acting against Holy Scripture."[422]

Rheticus is so sure of himself that he concludes:

> since…the motion of the earth may be considered as demonstrated truth, we need not fear that more balanced and learned judges will ascribe the marks of impiety to us.

Ironically, he uses the same argument about God's omnipotence that Urban VIII would use against Galileo, but in support of heliocentrism:

> Furthermore, there will not be lacking those who will bellow that it is monstrous to attribute movements to the earth, and who will take occasion to draw on and display their wisdom taken from

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[421] The words of Tiedeman Giese in his letter to Rheticus of July 26, 1543 that are included in Copernicus' *Briefe Texte*, letter no. 194, 359, the original Latin being: "opusculum tuum, quo a sacrarum scripturarum dissidentia aptissime vindicasti telluris motum." Cited in *The Church and Galileo*, p. 27.

[422] Rheticus' book was later published in 1651 by Johannes van Waersberge with the title *Cujusdam anonymi epistola de terrae motu*. A Latin text with an English translation has been published with the title: *G. J. Rheticus' Treatise on Holy Scripture and the Motion of the Earth*, Reyer Hooykaas, Amsterdam, North-Holland, 1984, as cited in *The Church and Galileo*, pp. 13, 27. But as Lerner notes: "This does not prevent him…from seeking to impose a heliocentric interpretation on certain passages of Scripture; here he sometimes goes well beyond the limits of the plausible" which "ran contrary…to the principle of accommodation that he had himself first called upon in his defense against the critics of Copernicanism. Rheticus does recognize, however, that the passages of Scripture quoted by him as implicitly heliocentric contain only 'obscure allusions' to the motion of the earth" (*ibid.*, "The Heliocentric 'Heresy,'" p. 13). Moreover, apparently, Rheticus also didn't think Holy Scripture was against his homosexual lifestyle, a common result from those who insist that various face-value propositions in Scripture can be demoted to something less than a literal meaning.

> the philosophers of nature. They are ridiculous, as if God's power could be measured by our capacities or our intellect. Are we to think that anything is impossible for God, who, by his Word, made the whole natural order out of nothing? Are we to tie God to the disputations of the Peripatetics.[423]

Rheticus' works, including the earlier pro-Copernican work, *Narratio prima*, were all placed on the *Index of Forbidden Books* published between 1559-1593, with a subsequent suppression of *Narratio* ordered by the Inquisition in 1598.[424] Tiedeman Giese (d. 1550), Bishop of Culm, whom Copernicus cites in his *Dedication to Paul III* as "my devoted friend…urged me…into publishing this book," had published his own book in 1536, titled *Hyperaspisticon*, taking the same course as Rheticus, that is, that Scripture was compatible with heliocentrism. Similarly, Nicholas Schöenberg, Cardinal of Capua, whom Copernicus refers to as "a man distinguished in all branches of learning," was also a supporter of the novel cosmology. Prior to these figures were Nicolas Oresme, Bishop of Lisieux (d. 1382)[425] who suggested that the Earth might be rotating, and Nicholas of Cusa, Bishop of Brixen (d. 1464)[426] who posited that the Earth was moving in some fashion, although not specifically by rotation or revolution. Naturally, both Oresme and Cusa claimed that they were not required to interpret Scripture literally.

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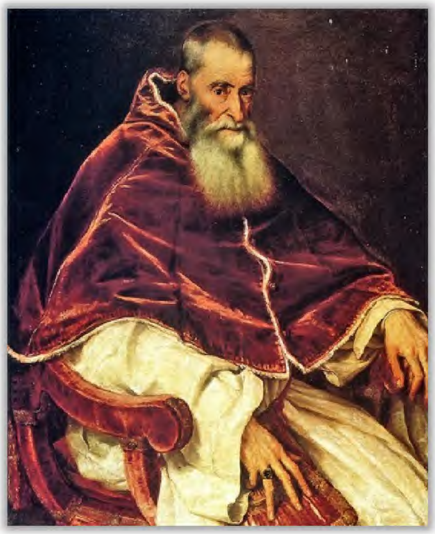
[423] *Cujusdam anonymi epistola de terrae motu*, p. 44, as cited in *The Church and Galileo*, pp. 12-13, 27.

[424] Lerner notes that the suppression of *Narratio prima* was "recently discovered" in a "document from the Arch episcopal Curia of Naples."

[425] Oresme's specific assertion was that the Earth might rotate on an axis. His works were, *Traité de la sphère*, later printed in Paris with the second edition published in 1508, and *Traité du ciel et du monde*, published in 1377, his heliocentric views are expressed in chapters 24 and 25.

[426] From his book *De docta ignorantia* ("Learned Ignorance"). Based on his concept of an infinite universe, Cusa argues: "…it is impossible for the machine of the world to have any fixed and motionless center; be it this sensible earth, or the air, or fire or anything else. For there can be found no absolute minimum in motion, that is, no fixed center, because the minimum must necessarily coincide with the maximum….The world has no circumference, because it is had a center and a circumference, and thus had a beginning and end in itself, the world would be limited in respect to something else….The earth, therefore, which cannot be the center, cannot be lacking in motion; but it is necessary that it move in such a way that it could be moved infinitely less. Just as the earth is not the center of the world, so the sphere of the fixed stars is not its circumference….Thus it is the blessed God who is the center of the world" (Alexander Koyré, *From the Closed World to the Infinite Universe*, 1957, pp. 11-12). We might say that Cusa was the first Relativist to express his thought in relativistic terms.



Pope Paul III

For Pope Paul III, having the historical distinction of forming the Congregation of the Roman Inquisition in 1542 for the precise purpose of defending the Catholic Church from heresy,[427] the time was growing ripe for a confrontation with those who were teaching that Scripture need not be interpreted literally when it addressed issues of cosmology. The fact that Copernicus' book, *De revolutionibus*, was printed by a Lutheran who also had printed other non-Catholic works that the Inquisition had censured, added a flavor of animosity to the issue that only religious disputes can generate. Bartolomeo Spina, the Master of the Sacred Palace from 1542 until his death in 1547, sought to have Copernicus' book banned, which was eventually carried out by his Dominican colleague Giovanimaria Tolosani, who died two years later in 1549. Apparently, Osiander's "hypothetical" disclaimer did not persuade these particular censors. Similar to Copernicus' effort to persuade Paul III, Tolosani wrote a detailed geocentric treatise in 1546, which he dedicated to Paul III and which included an endorsement from Spina. In it Tolosani vehemently rejected Copernicus' universe and declared it an extreme danger to the faith precisely because of its attempt to deliteralize Sacred Scripture.[428]

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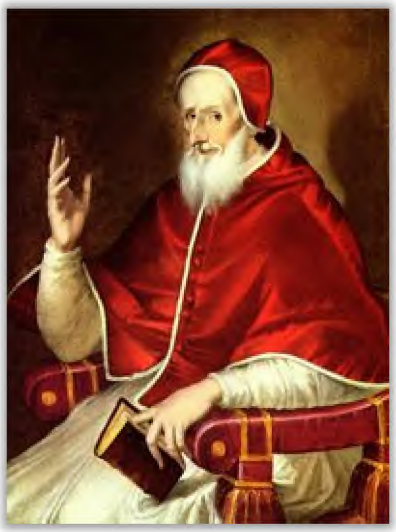
[427] Also known as the Congregation of the Holy Office or the Sacred Congregation. In 1965, Pope Paul VI changed the name to the Congregation for the Doctrine of the Faith.

[428] The work's title is: *On the Highest Immobile Heaven and the Lowest Stable Earth, and All Other Movable Heavens and Intermediate Elements*. Tolsani

As the 16th century reached the midway point, the staunchest anti-Copernican of the day was the Jesuit Christoph Clavius (d. 1612). He writes in his highly esteemed work:

> We conclude, then, in accordance with the common doctrine of the astronomers and the philosophers, that the earth lacks any local motion, either rectilinear or circular, and that the heavens themselves revolve continually round it…. Holy Scripture is also in favor of this doctrine, stating in a great number of places that the earth is stationary. It also bears witness to the fact that the sun and the other heavenly bodies are in motion.[429]



Pius V's 1566 Catechism of the Council of Trent

One of the clearest official and authoritative statements from the Catholic Church defending the doctrine of geocentrism comes from the catechism issued under a decree of **Pope Pius V**, known as *The Catechism of the Council of Trent* or more simply, *The Roman Catechism*. In light of its date, 1566, the Catechism comes as more or less the capstone to the Church's position since it had already rejected both Rheticus' and Copernicus' books on heliocentrism in the 1540s and put them both on the Index in 1559. The Catechism comes just seven years after the Index.

In its first instance of teaching geocentrism, the Catechism states:

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insisted Copernicus' teaching "could easily provoke discord between Catholic commentators on Holy Scripture and those who have resolutely decided to follow this false opinion. It is in order to avoid such scandal that we have written this short work" (English translation of the French translation *Aux origins*, p. 708, cited in *The Church and Galileo*, pp. 15-16).

[429] *In Sphaeram Ioannis de Sacro Bosco Commentarius*, Rome 1570, pp. 247-248, cited in *The Church and Galileo*, p. 18, 31. Clavius uses Psalms 19:5-6; 104:5 and Ecclesiastes 1:4-6 for his main support. See also: James Lattis' *Between Copernicus and Galileo*: *Christoph Clavius and the Collapse of Ptolemaic Cosmology*, University of Chicago Press, 1994.

> …He also gave to the sun its brilliancy, and to the moon and stars their beauty; and that they might be for signs, and for seasons, and for days and years. He so ordered the celestial bodies in a certain and uniform course, that nothing varies more than their continual revolution, while nothing is more fixed than their variety.[430]

Although this wording is somewhat brief, it correctly describes the Church's historical position. It states very clearly that the "sun…the moon and stars" are "celestial bodies" which move with a "certain and uniform course" and does not say that the Earth moves among them. Rather, to expel any doubt about what objects are revolving the catechism adds that the sun, moon and stars have a "continual revolution." Although the unspecified reference to "revolution" might cause a heliocentrist to infer that the sun's revolution does not necessarily mean it is revolving around the Earth, a few pages later the catechism disallows that inference by stating the following:

> The Earth also God commanded to stand in the midst of the world, rooted in its own foundation and made the mountains ascend, and the plains descend into the place which he had founded for them….[431]

Let's examine this a little more closely. Some have advanced the argument that in the above passage the word "Earth" (Latin: *terram*) should be translated as "dry land," and that "world" (Latin: *mundus*) should be translated "Earth." This translation portrays a "dry land" distinct from air and water, which was then filled with plants and animals, both of which are situated on the Earth.[432] As such, the passage would not be demonstrating an Earth in the center of the universe but merely a dry land placed on the Earth. This particular interpretation is falsified by the fact that the Catechism specifies that the *terram* stands in the "midst" or middle of the *mundus*. At creation, dry land was not made to be, or said to be, in the "midst" of the Earth. It is only said to be separated from water (see Gn 1:9). The dry land covered various parts of the surface of the earth, not the midst or middle of the earth. If the translation were "the midst of the earth" it would refer to the center of the earth, since the "midst" or "middle" of a sphere can only be the center of the sphere. Conversely, the surface of the land on the Earth does not possess a "midst" or middle position. Hence, the only way "midst" can make sense is if the Earth was placed in the middle of a rotating universe. Not surprisingly, this solution fits very well with the Catechism's statements about the sun and stars which, "by their motions and revolutions," must revolve around a central point, the "midst" or middle of the universe.

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[430] *The Roman Catechism, The Catechism of the Council of Trent*, translated by John A. McHugh, O.P. and Charles J. Callan, O.P., Tan Publishing, 1982, p. 27. This particular translation has a Nihil Obstat and Imprimatur, issued January 1923. The 1829 version says the same: "[God] so ordered the celestial orbs in a certain and constant course, that nothing can be seen more variable than their continual revolution, nothing more certain than that variety" (*Catechism of the Council of Trent*, Article 16, Chapter 2, translated by Fr. O'Donovan, Dublin, James Duffy and Sons, n. d., p. 38).

[431] *Ibid*., p. 28. The 1829 version reads: "God also, by his word, commanded the earth to stand in the midst of the world, 'founded upon its own basis'" (Article 18, Chapter 1). NB: the word "world" is from the Latin *mundus*, which means "universe." The clause "founded upon its own basis" may refer to the fact that, if the Earth were the universe's center of mass, it would be independent of all inertial forces, remaining in the center while neither resting upon or suspended by any force or object. As Job 26:7 says: "He…hangs the earth upon nothing."

The Roman Catechism then says the following toward the end:

> But though God is present in all places and in all things, without being bound by any limits, as has been already said, yet in Sacred Scripture it is frequently said that He has His dwelling in heaven. And the reason is because the heavens which we see above our heads are the noblest part of the world, remain ever Incorruptible, surpass all other bodies in power, grandeur and beauty, and are endowed with fixed and regular motion.[433]

A few pages later the Catechism confirms its cosmology and the God who designed it:

> …all goods both natural and supernatural, must be recognised as gifts given by Him from whom, as the Church proclaims, proceed all blessings. If the sun by its light, if the stars by their motion and revolutions, are of any advantage to man; if the air

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[432] Argued by David Palm in a 2010 debate with the author. Palm states: "Notice again that the Catechism states that God clothed the *terram* with 'trees and every variety of plant and flower.' He also filled it with living creatures, 'as He had already filled the air and water.' In other words, this *terram* is something distinct from the air and the water. The passage makes perfect sense if *terram* means 'dry land,' as it does in Gen 1:10. It makes no sense whatsoever if it means the entire earth, as in 'the globe'—which is what the neo-geo needs it to say." (See "Response to David Palm on Tridentine Catechism," Debate 2, at http://www.galileowaswrong.com).

[433] *Ibid.*, pp. 511-512.

> with which we are surrounded serves to sustain us...nay, those very causes which philosophers call secondary, we should regard as so many hands of God, wonderfully fashioned and fitted for our use, by means of which He distributes His blessings and diffuses them everywhere in profusion.[434]

Up to the publishing of the Roman Catechism, we see the following in the Church's teaching on the universe:

- that sun and stars move. It never says the earth moves and, in fact, says the earth "stands still."
- it says the sun and stars move in continual revolution. The only "revolution" that science and the Church knew was the stars and sun revolving around the earth.
- Oresme suggested the earth might be rotating, but such diurnal motion was rejected by the Church in 1541, 1548 and placed on the Index in 1559, as well as condemned both in 1616 and 1633.
- Cusa said the earth could be moving but not necessarily by rotating or revolution, but this was also rejected in 1541, 1548 and placed on the Index in 1559, as well as condemned both in 1616 and 1633.
- the Tridentine catechism entertained no alternate scientific theory (*i.e.*, heliocentrism) when it supported geocentrism. It made no statement accepting heliocentrism. It made no mention of acentrism, or any other view. It gave no credence to Oresme, Cusa, Aristarchus, Pythagorus or any view that said the earth moved;
- the Tridentine catechism knew that the Catholic tradition believed the earth did not move and it makes no statement that indicates a break with the Church's tradition, including no break against the consensus of the Fathers on geocentrism.

One of the more significant facts regarding the Roman Catechism's dogmatic assertion of geocentrism is that it remained unchanged in all subsequent editions, including the last Roman Latin version in 1907 and the 1914 edition published in Turin, which, incidentally, was just three years before the Fatima visions of 1917 showing the sun moving in the sky. Obviously, no editor saw fit to remove the geocentric teaching from the catechetical regimen of Catholic doctrine. The introduction states:

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[434] *Ibid.*, p. 516.

> The original manuscript of the Catechism is not extant. But of the innumerable Latin editions that have appeared, the earliest are: The Manutian (Rome, 1566), so called because it was printed by Paulus Manutius by command of Pope Pius V….Among later Latin editions may be mentioned the following issued at Rome: The edition of 1761, which contains the Encyclical of Clement XIII on the excellence and use of the Roman Catechism; the Propaganda editions of 1858, 1871 and 1907.[435]

Also highly significant is the fact that the Roman Catechism makes a point of not only reiterating the dogmatic decrees from the Council of Trent, but its purpose was also to "examine every statement in the Catechism from the viewpoint of doctrine,"[436] which requires us to conclude that among the statements subjected to the prescribed analysis were the four geocentric catechetical teachings noted above. This is a clear indication that Pius V understood geocentrism as Catholic doctrine.

Despite the clear wording of Trent's catechism, the pressure from the Copernicans was great and scholars vacillated between geocentrism and heliocentrism. In 1584, Didacus à Stunica (d. 1600), a professor of Scripture at Osuna and Toledo, wrote in his *In Iob commentaria*[437] an exegesis of the cosmological passages in the book of Job. At this particular time, Stunica had accepted the heliocentric model because he was convinced that it helped astronomers to calculate the length of the year and the rate of the precession of equinoxes. Hence Stunica argued, for example, that Job 9:6 ("who shakes the earth out of its place, and its pillars tremble") could be interpreted as portraying the mighty power of God that would be needed to move the massive Earth around the sun. As we noted in Chapter 14, however, Job 9:6 actually strengthens the geocentric argument, since in specifying "pillars" the verse is only speaking about the internal tremblings of the Earth, in addition to the fact that the verse presupposes the Earth is already locked in place if it has to go through a temporary shaking. As determined as he was to interpret Job in a literal manner, Stunica spiritualized other passages. For Ecclesiastes 1:4 ("A generation goes, and a generation comes, but the earth remains for ever. The sun rises and the sun goes down, and hastens to the place where it rises") he argued that it did not refer to Earth's immobility but to its unchanging nature in contrast to the vacillations of human life; and that the movement of the sun was to be understood as speaking in the common language of the people. But in 1597 Stunica published his *Philosophiae prima pars* that rejected his previous view that the Earth moved. Stunica realized that, for all the arguments that Copernicus put forth as having the sun at the center, they could be explained equally well with the Earth at the center. Moreover, regarding the rotation of the Earth he stated:

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[435] *Ibid*., p. xxvi. Even later, namely 1969, is the French version of Roman Catechism, *Catechisme du Concile de Trente* (Paris: Itinéraires, 1969, p. 30), stating: *Dieu affermit aussi la terre sur sa base, et par sa parole Il lui fixa sa place au milieu du monde* ("The earth also God commanded to stand in the midst of the world, rooted in its own foundation").

[436] *Ibid*., p. xxv.

[437] 1584 in Toledo and reprinted in 1591 in Rome. He is also known as Diego de Zuñiga.

> The motion that is most difficult to accept and that makes the opinion of the motion of the earth seem absurd to me is that whereby the whole earth is turned in rotation in the space of twenty-four hours.[438]

Even though Stunica had changed his mind, his previous work advocating heliocentrism was included in the condemnation of Galileo on March 5, 1616.

Following Stunica was Juan de Pineda (d. 1637) with his 1600 work *Commentaria in Job libri tredecim*, and Jean Lorin (d. 1634) in his 1605 work *In Acta Apostolorum commentarii*. The most celebrated was Nicolas Serarius (d. 1609) in his 1609 work on Joshua 10, *Josue ab utero ad ipsum usque tumulum*, in which he writes:

> Although in order to escape reprobation Copernicus dedicated his revolutions to the pope, nevertheless, in so far as his hypotheses are supposed to be held to be true, I do not see how they can avoid being tainted with heresy. For Scripture always keeps the earth at rest and gives motion to the sun and to the moon, so that when these heavenly bodies stand still one can see that it is on account of a great miracle.[439]

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[438] Book 4, Chapter 5 of *Philosophiae prima pars*, published in Toledo in 1597, as cited in *The Church and Galileo*, p. 40.

[439] *Josue ab utero*, ch. 10, question 14, p. 238, as cited in *The Church and Galileo*, pp. 19, 32.

A year after Serarius' work, Galileo published his now famous *Siderius nuncius* ("Starry Messenger"), which was the first time he had made public his allegiance to Copernicanism. As we noted in earlier, prior to 1610 Galileo kept totally silent about his heliocentric views and even taught the geocentric system in public. Perhaps what prompted him to take a chance exposing his private views in this dangerous climate was what Kepler had concluded about the Catholic Church and its official treatment of Copernicus (barring the critiques that heliocentrism had received from Tolasani, Clavius, *et al.*). Kepler notes:

> All the popes since 1542…have interpreted Scripture in such a way that none of them have so far accused Copernicus – even apart from the fact that Copernicus dedicated his work *De revolutionibus* to Paul III – of error or of heresy.[440]

True, the popes of the sixteenth century had more or less refrained from participating in the cosmological debate. After all, Paul III's original request to Copernicus was for the purpose of finding a way to fix the calendar. Little did the prelature know that this seemingly small matter would blow up into a mushroom cloud on the theological and scientific landscape. Galileo somehow became the fuse that would set the refuse pile on fire to blaze in front of the highest authorities in the world. In that day and time there was no entity with greater power than the Inquisition and no one who could direct its steps more authoritatively than the pope in Rome. The showdown had arrived.

The first on the scene was the philosopher and mathematician Lodovico delle Colombe. He was the main speaker for a group of Florentines who wanted to expose Galileo. Galileo's supporters satirically referred to this group as the "League of Pigeons," mocking Colombe's name that means "dove" in Italian. In his 1610 work *Trattato contro il moto della terra* ("Treatise Against the Motion of the Earth") Colombe based his attack against Galileo's cosmology by an appeal to the consensus of the Church Fathers and the traditional interpretation of Scripture. Colombe writes:

> Replies which assert that Scripture speaks according to our mode of understanding are not satisfactory: both because in explaining the Sacred Writings the rule is always to preserve the literal sense, when that is possible, as it is in this case; and also

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[440] "Antwort auf Roeslini Diskurs,"Kepler's *Gesammelte Werke*, 4:106, lines 18-20, translated by Michel-Pierre Lerner in *The Church and Galileo*, p. 19. Lerner also notes Kepler saying the same in 1605 (*ibid*, 15:183, no. 340, lines 95-102).

> because all the Fathers unanimously take this passage to mean that the sun which was moving truly stopped at Joshua's request. An interpretation which is contrary to the unanimous consent of the Fathers is condemned by the Council of Trent, Session IV, in the decree on the edition and use of the Sacred Books. Furthermore, although the Council speaks about matters of faith and morals, nevertheless it cannot be denied that the Holy Fathers would be displeased with an interpretation of Sacred Scriptures which is contrary to their common agreement.[441]

By 1613 things became even more heated, as the Grand Duke of Tuscany, Cosimo II (Medici), and his mother the Grand Duchess, Christina of Lorraine (the grand daughter of Catherine Medici, queen of France), got into the picture.[442] On December 12 of that year, a friend of Galileo's, Benedetto Castelli, attended a luncheon with the Grand Duke and his mother. Prompted by a whispering in her ear from Cosimo Boscaglia (professor of philosophy at Pisa), the Duchess asked Castelli if a moving Earth was contrary to Scripture. One thing led to another and by the end of the evening Castelli had secured an admission from Boscaglia that heliocentrism was true. Taking advantage of this development from people in high places, Galileo saw this as an opportunity to add Scripture to his evidence and thus wrote a long letter to Castelli on the subject. He asserted, much to the dismay of Colombe, that Scripture had no intention of teaching about the order and motions of the celestial bodies. As noted in Chapter 14, however, Galileo also made the claim that the literal reading of Joshua 10:10-14 was in conformity to heliocentrism.[443] Once Galileo added Scripture to his arguments, it became a whole different issue. It was here that the tide really began to turn against him. A year later on December 21, 1614, Tommaso Caccini, a member of the League of Pigeons, preached against Galileo in Florence at the church of Santa Maria Novella. The next year, 1615, Galileo is now 50, perhaps old enough for him to contemplate sparring with the Catholic hierarchy over what appears to be his lifelong dream. But he receives a letter from **Federico Cesi** on January 12, 1615 telling him not to respond to Caccini due to the fact that Cardinal Bellarmine was resolute against defending Copernicanism from Scripture:

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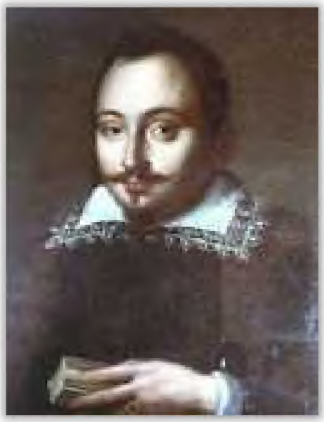
[441] *Le Opere di Galileo Galilei*, Vol. 5, p. 411, translation in Blackwell's *Galileo, Bellarmine and the Bible*, p. 63.

[442] Cosimo II had ascended the throne upon his father's death, Ferdinand I, in 1609. Ferdinand I had appointed Galileo to the professorship of mathematics at the university of Pisa in 1588. Galileo had tutored Cosimo during summers when he was a lad. Galileo dedicated his book *Siderius Nuncius* (the first public admission of his heliocentrism) to Cosimo in 1610 and Cosimo in turn gave Galileo a court position in the same year. Cosimo became ill in 1615 when Galileo's troubles with Bellarmine were just beginning, and he died in 1620. His son, Ferdinand (II), ascended the throne, but since he was only ten his grandmother, Christina, and mother, Maria Magdalena of Austria, governed the palace affairs. Ferdinand was not close to Galileo and did not involve himself in the cosmological disputes. He died in 1670.

[443] In *Le Opere di Galileo Galilei*, vol. 5, pp. 284, 286. The Italian reads: "Io dico che questo luogo [Js 10:12] ci mostra manifestamente la falsità e impossibilità del mondano sistema Aristotelico e Tolemaico, e all'incontro benissimo s'accomoda



> As for the opinion of Copernicus, Bellarmine himself, who is the head of the congregation on these issues, has told me that it is heretical, and that the motion of the Earth is, without any doubt, contrary to Scripture.[444]

On March 7, 1615, Galileo received a letter from Monsignor Dini that portrays Bellarmine as a bit more accommodating:

> In respect to Copernicus the Cardinal said that he could not believe that he would be prohibited; rather he believes that the worst thing that could happen to Copernicus would be that some marginal notes might be added to the effect that his doctrine was introduced to save the appearances, or some such thing, similar to those who have introduced epicycles but do not believe in them.[445]

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co'l Copernicano." The same is reiterated in the *Letter to Christina*, *ibid*., vol. 5, pp. 343-348, cited in *The Church and Galileo*, p. 33.

[444] Original Italian: "Quant' all' opinione di Copernico, Bellarmino istesso, ch' è de' capi nelle congregatione di queste cose, m' ha detto che l' ha per heretica, e che il moto della terra, senza dubio alcuno, è contro la Scrittura" (*Le Opere di Galileo Galilei*, vol. 12, p. 129).

[445] Original Italian: "E quanto al Copernico, dice S. S. Ill.^{ma} non poter credere che si sia per proibire, ma il peggio che possa accaderli, quanto a lui, crede che potessi essere il mettervi qualche postilla, che la sua dottrina fusse introdotta gli epicicli e poi non gli credone" (*Le Opere di Galileo Galilei*, vol. 12, p. 151).

The balance between the two letters is easy to determine. Although Bellarmine was willing to accommodate Galileo by allowing Copernican theory as an appearance-saving model, the very reason he put such strict prohibitions on it was that he considered heliocentrism erroneous and heretical. In that respect, Bellarmine was quite adamant with Dini that Psalm 19:5-6[446] meant that the sun revolved around the Earth and not vice-versa. Galileo retorted with a lengthy letter to Dini on March 23, 1615 denying Bellarmine's claims, although with a large amount of deference to the Church as the final arbiter. Galileo insists that when Copernicus wrote his book he recognized that if the Ptolemaic system failed and could not be true to the appearances, "this other one would have acquired a much greater degree of truth and reality…the knowledge of the true arrangement of the parts of the world."[447]

Galileo then added:

> A little further on it is said [by Bellarmine] that the principal authors who introduced eccentrics and epicycles did not consider them to be true. I will never believe this…to wish to admit the mobility of the earth only with the same concessions and probability attributed to epicycles and eccentrics is to admit it most securely, truly, and irrefutably…. Thus in regard to Copernicus it is my opinion that the mobility of the earth and the stability of the sun are not open to compromise…[448]

On several occasions in the letter, however, Galileo voluntarily submits his opinion to the judgment of the Church:

> I now wish with the same zeal to offer them next at the feet of the Highest Pastor and to the infallible determination of the Holy Church…. My only intention is…to be obedient to the wishes of my superiors, and to submit all my work to their decision…I am inferior to all and place myself below all wise men."[449]

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[446] "In them he has set a tent for the sun, which comes forth like a bridegroom leaving his chamber, and like a strong man runs its course with joy. Its rising is from the end of the heavens, and its circuit to the end of them," LXX Ps 18:5-6.

[447] Original Italian: "…molto più ciò si arebbe ottenuto dalla vera e reale…qual è il sapere la vera disposizione delle parti del mondo" (*Le Opere di Galileo Galilei*, letter to Dini, March 23, 1615, vol. 5, p. 298), from Blackwell's translation in *Galileo, Bellarmine and the Bible*, p. 209.

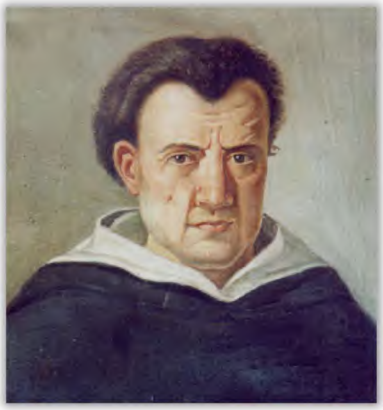
[448] *Ibid.*, pp. 210-211.

[449] *Ibid.*, pp. 211, 212.

Regardless of his humble demeanor, considering that Galileo openly admitted that he believed Copernicus gave us the "true arrangement of the parts of the world," it was now time for the Church to step in and put the brakes on what appeared to be a runaway train. After hearing about Caccini's attack on Galileo, the Dominican friar, Niccolo Lorini, sought a copy of the letter Galileo wrote to Castelli. After reading it he was convinced that Galileo had overstepped his bounds regarding the interpretation of Scripture. He then sent a copy of the letter to Cardinal Paolo Sfondrati who was the Prefect of the Congregation of the Index, and it was then passed on to Cardinal Giovanni Millini who was Secretary of the Holy Office. It was now only a matter of time before Galileo would be silenced.

Official Sanctions against Copernicanism

In 1615, 1616, 1633 and 1664 the Catholic Church issued various formal judgments against the Copernican theory, and especially against its main purveyor, Galileo Galilei. One of the first acts that led to an official censoring of heliocentric cosmology was that directed against the Dominican, **Tommaso Campanella** (d. 1639). Defending Galileo's 1610 work, *Siderius nuncius*, Campanella writes:



> Let us rejoice if the theologians protest; the Fathers of theology will defend you with their prophecies: Chrysostom and his master, Theodore, the Bishop of Tarsus, and Procopius of Gaza, who taught that the heaven is motionless…. Augustine taught that this opinion had been proven according to the rules of the astronomers of his day and said we should not challenge it by relying on Holy Scripture and so become the laughingstock of the astronomers. This is a principle he himself ought to have

> followed when he denied the antipodes. You have on your side Origen, who taught that the earth and all the heavenly bodies are alive and who praised and proved the teachings of the Pythagoreans with the aid of the Scriptures.[450]

Campanella's defense was very weak. As noted in Chapter 15, Chrysostom gave no support to heliocentrism.[451] That Campanella would cite some ambiguous passage from Chrysostom for support of heliocentrism shows how desperate his case was. Additionally, contrary to Campanella's claims, neither Theodore of Tarsus nor Procopius of Gaza were in the heliocentric camp.[452] Augustine likewise offers him no support. Moreover, Augustine did not say that astronomy could not be challenged by Holy Scripture; rather, he said that unless astronomers had *proof* of their claims, no one was required to accept their theories, especially when those theories contradicted the literal reading of

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[450] *Lettere*, ed. V. Spampanato, Bari: Laterza, 1927, no. 31, p. 166-167, as cited in *The Church and Galileo*, pp. 21-22, 34.

[451] Chrysostom writes: "For they who are mad imagine that nothing stands still, yet this arises not from the objects that are seen, but from the eyes that see. Because they are unsteady and giddy, they think that the Earth turns round with them, which yet turns not, but stands firm. The derangement is of their own state, not from any affection of the element" (*Homily on Titus*, III).

[452] Campanella's reference to Theodore being the "master" of Chrysostom would require him to be in the 4th century, but the only one answering to that identity is Diodor (d. 393) who was the bishop of Tarsus and with whom Chrysostom and Theodore of Mopsuestia were associated in the Antiochian school of theology. Campenella may be confusing Chrysostom's belief, according to one author, that "…the vault of heaven was fixed and motionless over the earth. Sun, moon and stars circled day by day about the fixed orb of the world" (Rev. Chrysostomus Baur, John *Chrysostom and His Time*, trans. Sr. M. Gonzaga, Buchervertriebsanstalt, Notable and Academic Books 1988). Baur cites Chrysostom's *Homily XII* as the source, but as we noted in Chapter 13, Chrysostom merely says that the heavens are immobile, but that the sun and stars revolve around a fixed earth: "The heaven, for instance, hath remained immoveable, according as the prophet says, "He placed the heaven as a vault, and stretched it out as a tent over the earth." But, on the other hand, the sun with the rest of the stars, runs on his course through every day. And again, the earth is fixed, but the waters are continually in motion; and not the waters only, but the clouds, and the frequent and successive showers, which return at their proper season" (*Homilies to Antioch*, Homily XII, PG 49, 128). There is no evidence that Procopius of Gaza (d. 528) supported heliocentrism, rather, he contested the belief of antipodes (that there were two sides to the earth).

Scripture.[453] Additionally, Augustine's remark that Christianity might become a "laughingstock"[454] was certainly not directed against the belief in geocentrism. Augustine was one of the patristic era's most ardent geocentrists. It was directed, rather, to instances in which a Christian entered areas of both theology and science of which he was ignorant. As we will see in Chapter 17, when the issue of the authority of Scripture in a matter of science was at stake, Augustine put his full weight behind Scripture, as was the case, for instance, in his insistence on the existence of the waters above the firmament:

> But whatever the nature of that water and whatever the manner of its being there, we must not doubt that it does exist in that place. The authority of Scripture in this matter is greater than all human ingenuity.[455]

Still, in his book, *Apologia pro Galileo*, Campanella sought to convince the Inquisition that heliocentrism was not contrary to Scripture. He also attempted to convince Bellarmine by appealing to the "political" dangers of condemning Galileo, as well as the aforementioned argument that the Church would be "laughed at" by the world:

> I think that this [Galileo's] philosophical method should not be condemned. One reason for this is that it will be embraced even more enthusiastically by the heretics and they will laugh at us. For we know how greatly those who live north of the Alps complained about some of the decrees adopted at the Council of Trent. What will they do when they hear that we have attacked the physicists and the astronomers? Will they not immediately proclaim that we have done violence to both nature and the Scripture? Cardinal Bellarmine is well aware of this.[456]

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[453] But if they are able to establish their doctrine with proofs that cannot be denied, we must show that this statement of Scripture…is not opposed to the truth of their conclusions (*The Literal Interpretation of Genesis* Book 2, Chapter 9, paragraph 21.)

[454] "Now, it is a disgraceful and dangerous thing for an infidel to hear a Christian, presumably giving the meaning of Holy Scripture, talking nonsense on these topics; and we should take all means to prevent such an embarrassing situation, in which people show up vast ignorance in a Christian and laugh it to scorn" (*The Literal Meaning of Genesis*, Bk 1, Ch. 19, No. 39).

[455] *The Literal Meaning of Genesis*, Bk 2, Ch. 5, No 9.

[456] Tommaso Campenella, *Apologia pro Galileo*, published in 1622 but perhaps reviewed by the Inquisition as early as March 1616. Cited in Blackwell's *Defense*

The Church Confronts Fr. Paolo Antonio Foscarini

The above text from Campanella had reached Rome by March 1616, but in the prior year Bellarmine had already made up his mind that Copernicanism was to be rejected. This verdict was decided in the case of the Carmelite friar, Fr. Paolo Antonio Foscarini. The Inquisition's censor determined that Foscarini's 1615 work defending heliocentric cosmology, *Lettera sopra l'opinione de'Pittagorici e del Copernico*, was erroneous. The text of the censor's words are very intriguing, since they give us a unique look into the hermeneutical philosophy that was the foundation of the Church's judgments:

> This treatise excessively favors the rash opinion of the motion of the earth and the immobility of the sun, as is clear on pages 8 to 11. On page 9 the author not only refutes but also ridicules many things which are taught by the authors of the opposite opinion. On page 13 he openly says, 'the indicated opinion has a clear probability.' But what is clearly contrary to Sacred Scripture obviously cannot be probable.
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> On page 24 he says that the words of Genesis, 'Evening and morning came the first day,' should not be understood literally and as referring to nature, but only in relation to the earth and to us. But this cannot be said…. From page 29 to the end of the treatise the author tries to defend the indicated opinion by showing that Sacred Scripture can be reconciled with it, and thus anyone can embrace it without any fear of contradicting the sacred teachings. But his reconciliation contorts the Sacred Scriptures, and explains them contrary to the common explication of the Holy Fathers, which agrees with the more common, indeed the most common, and most true opinion of almost all astronomers.
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> On page 29 he says that the words of Psalm 92 (93), 'For he has made firm the orb of the earth which will not move,' and those of Psalm 103 (104), 'He established the earth on its own foundation which will not move forever,' are to be understood according to appearances. But this explication cannot be accepted. For when a real reason or cause of some effect is assigned, it cannot be understood as only an appearance. And in

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of Galileo, p. 79, translation modified by Lerner in *The Church and Galileo*, pp. 23, 35.

> those texts the Holy Spirit assigns the reason for the immobility of the earth, when he says that it is established on its own foundation.
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> On pages 38 and 39 the author explains the above passages in a different way when he says that the earth is immobile in the sense that it is constant and stable in its own motions. Against this stands the fact that the same thing could be said of the moon and of the other celestial orbs and stars.
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> On page 41 he explains the immobility of the earth in a third way, namely, that it moves in such a was that it does not leave the place which is natural to it. Against this likewise stands the fact that the author says nothing specifically about the earth which is not also found in the other elements and the celestial orbs.
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> On page 45 he says that the heavens are very thin and tenuous, not solid and dense. This is clearly contrary to Job 37,[457] 'Together with this you have created the heavens which are most solid and spread out like the air.' This cannot be explained as an appearance (as the author indicates) because the solidity of the heavens is not apparent to us.[458]

Foscarini sought to defend his views in a 4000-word reply to the censor. His main argument was one that was common during that day. For some reason the very scholars that could barely see craters on the moon were absolutely certain that "the earth moves…an opinion which has been confirmed by weighty arguments by many of the most learned astronomers of our day."[459] Consequently, it is no surprise that Foscarini subsequently argues that this celestial fact

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[457] Blackwell has "Tobit 37" but this is most likely a misreading of the original Latin, since Tobit's fourteen chapters say nothing about how the heavens were made. The proper translation of the censor's word is "Job 37:18" (which might look and sound like Tob..it 37). Job 37:18 reads: "Can you, like him, spread out the skies, hard as a molten mirror?" (RSV); "Thou perhaps hast made the heavens with him, which are most strong, as if they were of molten brass" (DR). The literal meaning is that the sky, the heavens or the firmament is not a tenuous, vaporous entity. Although ostensibly it is transparent and pliable, on another level (implied is the subatomic level) Jb 37:18 indicates the heavens are composed of a super dense material substance (as we noted in Volume I). At the beginning of creation it was expanded to fill the firmament, or became the firmament once it was expanded. Essentially, the heavens are both flexible and rigid. Foscarini's censor understood this dual nature of the firmament by noting that "the solidity of the heavens is not apparent to us."

[458] The censor's document is titled: *Judicium de spistola F. Pauli Foscarini de mobilitate terrae* (Lerner in *The Church and Galileo*, p. 24) and the text is provided by Blackwell in *Galileo, Bellarmine and the Bible*, pp. 253-254.

> …agrees most fittingly with the Scriptures according to the methods and arguments used by the Holy Fathers, if one follows exactly the rules of the Holy Fathers and scholastic theologians which they themselves used most frequently in interpreting the Scriptures.

We see the same sort of reasoning still today. The objector begins from the position of being convinced that science has proven the Earth moves. Once this scientific premise is established, he has no choice but to assert the corollary point – that it is not necessary to interpret Scripture literally. Logically, he must then insist that the Fathers of the Church had agreed on using a non-literal hermeneutic. Similar to Campanella, Foscarini will cite Fathers who interpreted various passages in a non-literal way in the hopes of using the example as a sounding board for all the patristic writers and all the passages dealing with cosmology. The facts are these, however: (1) no one, especially in Foscarini's day, had proven that the Earth was in motion. Accordingly, we are not surprised that Foscarini cites no specific "astronomer" of his day who possessed such proof. As we have discovered, it is a fact of science that every phenomenon occurring in the heavens, be it eclipses, parallax, aberration, centrifugal force, *etc*., can be explained just as well from the perspective of a non-moving Earth and a rotating universe; (2) As we discovered in Chapter 15, all the Fathers of the Church were geocentrists. There was not one who advocated a heliocentric view, even though these same Fathers were aware that the Greeks from the Pythagorean school were advocating heliocentrism. Hence, if Foscarini's claim is true that we must "follow exactly the rules of the Holy Fathers…which they themselves used most frequently in interpreting the Scriptures," we should just as easily be able to conclude that their "exact rules" led them to interpret Scripture to teach geocentrism, since they were all geocentrists with no exceptions. What other conclusion could be drawn? Basically, Foscarini sought to employ the same argument we hear so often today against putting trust in Scripture to teach us true facts about the cosmos. Foscarini merely shifts this argument and places it against the Holy Fathers, arguing that they can only be trusted when they speak as one on matters of the Christian faith, not on cosmological information they glean from Scripture. He writes:

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[459] As cited in Blackwell's *Galileo, Bellarmine and the Bible*, p. 255.

> Thus Vincent of Lérins, a most learned and zealous defender of the dogmas of the Church, in his golden booklet against the profane novelties of heretics, says that we should investigate and follow with great care the consensus of the Holy Fathers, not in every little question of the divine law, but only or especially in the rules of faith. In *Contra Faustum*, Book 2, Chapter 13, St. Augustine says that the Holy Fathers and all the authors who fall outside of the canonical Scriptures sometimes perhaps say things which do not agree with truths that are rather hidden and difficult to know….while the connection to the faith is preserved, the best and most learned defenders of the Catholic rules sometimes disagree, as Augustine says in *Contra Julianum*, Book 1. Likewise some of the Fathers can occasionally teach something contrary to truth…Hence it is not rash to depart from the common interpretation of the Fathers in matters not pertaining to the faith, especially if this occurs because of a pressing and persuasive reason.[460]

We can safely assume that the "pressing and persuasive reason" that would convince Foscarini to "depart from the common interpretation of the Fathers" was what he stated in the opening lines of his letter: "the earth moves…an opinion which has been confirmed by weighty arguments by many of the most learned astronomers of our day." This assumed scientific fact forces Foscarini to find some rationale for discounting what he knows is a solid patristic consensus of both the literal interpretation of biblical cosmology and the immobility of the Earth. The only way to do so is for Foscarini to make a dichotomy between the spiritual and the corporeal, and declare that the Fathers were always right on the former but sometimes wrong on the latter.

Foscarini uses the same kind of argument to make a similar dichotomy in Scripture, which, incidentally, is the same argument used in modern times. He writes:

> Many authorities have shown that the Sacred Scriptures most wisely speak to the hearing of the common man, and in matters pertaining to the human sciences, it does not much care what opinion anyone holds; it accommodates itself to any opinion and to the common manner of speaking. Thus in his commentary on Jeremiah 28 St Jerome says that many things are said in the Scriptures according to the opinion of the time in which the events occurred, and not according to the truth of the matter.

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[460] *Galileo, Bellarmine and the Bible*, pp. 256-258.

> Thus when Scripture speaks of God's arm, the literal sense is not that he actually has such a bodily part, but rather what the bodily part signifies; namely, his operative power….

Perhaps sensing that he must give at least some room to the literal reading of Scripture, Foscarini then closes his argument by attempting to convince the censor that the Earth remains at rest not in the sense of motion but in its own peculiar way, a way which he never actually explains.

> When the Scriptures say that the earth is at rest and the sun moves, using the opinion of the common man and the common opinion of some of the ancient wise men, who did not perceive this as clearly as their successors…it does not say anything false because it describes them in this way. For the earth truly has a certain state of rest of its own, but in a different sense than is commonly thought. And the sun truly has motion of its own, for it rotates on itself around its own center in thirty days (as is seen from sunspots.) Therefore the earth is at rest and the sun moves, but not in the ways that the common man thinks nor as the common opinion of philosophers has held up to now, but is a more subtle way.

He then completes the case by drawing, once again, on what he believes is the scientific consensus of the Earth's movement.

> But the ancient sages up to the present have not known this because they did not observe or grasp (they were unable, not possessing the instruments recently invented by human ingenuity) those things which were reserved for the observation and apprehension of the present age by the singular and marvelous providence of God.[461]

> When Solomon said "there is nothing new under the sun," we now know why. Five hundred years after Foscarini the same arguments are still being voiced for heliocentrism, only in more detailed and sophisticated ways. Today it is claimed that: (a) the Bible speaks with neither literalness nor authority on such mundane issues; (b) the Fathers made erroneous conclusions in their consensus on biblical cosmology; and (c) various scientific "proofs" show the Earth is moving. Where today a sophisticated

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[461] *Galileo, Bellarmine and the Bible*, pp. 259-263.

telescope might detect a distant star with planets circling around it, in Foscarini's day the telescope was pointed toward Jupiter wherein one could watch its moons circling the Jovian giant. Both then and now the revolutions of the smaller around the larger would be used as "proof" that the Earth, because it is smaller than the sun, is required to revolve around it, and never vice-versa. Likewise, it was argued that if the sun itself rotates (since we can see black spots circling its circumference), analogously the Earth should also rotate. Galileo had also argued that, because the sunspots changed the angle of their path according to an annual cycle and not a daily one, the system had to be heliocentric. As we have discovered, however, there is science, and then there is *science*. As noted in Volume I, modern science has shown that the above arguments provide no proof for a moving Earth. In fact, it can be safely said that one of the only true facts of science is that science has not proven that the Earth moves. Unfortunately, however, if in spite of the factual evidence a person is convinced that science has proven the Earth moves, there is little that can persuade him otherwise. Neither Scripture, nor the patristic consensus nor the magisterium will trump what one believes is a fact of science, and the modern science community has made certain that the public believes that heliocentrism is a fact.

As was the case with Campanella, none of Foscarini's arguments impressed either the censors or **Cardinal Bellarmine**. They could easily see that these men were driven to disregard the patristic consensus and confine Scripture to spiritual matters because they were all under the mistaken notion that science had proven the Earth moved.

But Bellarmine knew that the burden of proof was on the challengers, not the Church, and a huge burden it was. No one had produced any proof of heliocentrism and thus Bellarmine wouldn't even consider, much less accommodate, any softening of his views on either Scripture or the patristics.

On April 12, 1615, Bellarmine wrote a personal letter to Fr. Foscarini answering his claims in three short rebuttals, the original written in Italian.

To the Very Reverend Father Paolo Antonio Foscarini,
Provincial of the Carmelite Order of the Province of Calabria:

My Very Reverend Father,

I was pleased to read the letter in Italian and the treatise in Latin which Your Reverence sent to me. I thank you for both of them, which indeed are quite full of ingenuity and learning. And since you have asked for my reactions, I will state them very briefly, for you now have little time to read and I have little time to write.

Firstly, I say that it appears to me that Your Reverence and Sig. Galileo have acted prudently in being satisfied with speaking in terms of assumptions and not absolutely, as I have always believed Copernicus also spoke.[462] For to say that the assumption that the earth moves and the sun stands still saves all the appearances better than do eccentrics and epicycles is to speak well, and contains nothing dangerous. But to wish to assert that the sun is really located in the center of the world and revolves only on itself without moving from east to west, and that the earth is located in the third heaven and revolves with great speed around the sun, is a very dangerous thing, not only because it irritates all the philosophers and scholastic theologians, but also because it is damaging to the Holy Faith by making the Holy Scriptures false.[463] Although Your Reverence has clearly exhibited the many ways of interpreting the Holy Scriptures, still you have not applied them to particular cases,[464] and without doubt you would have encountered the very greatest difficulties if you had tried to interpret all the passages which you yourself have cited.

Second, I say that, as you know, the Council [of Trent] has prohibited interpretation of Scripture contrary to the common agreement of the Holy Fathers.[465] And if Your Reverence will read not only the Holy Fathers but also the modern commentaries on Genesis, the Psalms, Ecclesiastes, and Joshua, you will find that they all agree on the literal interpretation that the sun is in heaven and rotates around the earth with great speed, and that the earth is very far from the heavens and stands immobile in the center of the world.[466] Ask yourself then how could the Church, in its prudence, support an interpretation of Scripture which is contrary to all the Holy Fathers and to all the Greek and Latin commentators. Nor can one reply that this is not a matter of faith, because even if it is not a matter of faith because of the subject matter [*ex parte objecti*], it is still a matter of faith because of the speaker [*ex parte dicentis*].[467] Thus anyone who would say that Abraham did not have two sons and Jacob twelve would be just as much of a heretic as someone who would say that Christ was not born of a virgin, for the Holy Spirit has said both of these things through the mouths of the Prophets and the Apostles.

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[462] "…facciano prudentemente a contentarsi di parlare *ex suppositione* e non assolutamente, come io ho sempre creduto che habbi parlato il Copernico" (*Le Opere di Galileo Galilei*, vol. 12, p. 171).

[463] "ma anco di nuocere alla Santa Fede con rendere false le Scritture Sante" (*ibid.*).

[464] "molti modi di esporre le Sante Scritture, ma non li ha applicati in particolare" (*ibid.*).

[465] "…il Concilio prohibisce esporre le Scritture contra il commune consenso de'Santi Padri" (*ibid.*, p. 172).

Thirdly I say that whenever a true demonstration would be produced[468] that the sun stands in the center of the world and the earth in the third heaven, and that the sun does not rotate around the earth but the earth around the sun, then at that time it would be necessary to proceed with great caution in interpreting the Scriptures which seem to be contrary,[469] and it would be better to say that we do not understand them than to say that what has been demonstrated is false. But I will not believe that there is such a demonstration, until it is shown to me.[470] To demonstrate that the assumption that the sun is located in the center and the

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[466] "…trovarà che tutti convengono in esporre ad literam ch'il sole è nel cielo e sta nel centro del mondo, iimmobile" (*ibid.*).

[467] "Nè si può rispondere che questa non sia material di fede, perchè se non è material di fede *ex parte obiecti*, è material di fede *ex parte decentis*" (*ibid.*).

[468] "…quando ci fusse vera demostratione…" (*ibid*).

[469] "…alhora bisogneria andar con molta consideratione in esplicare le Scritture che paiono contrarie…" (*ibid.*).

[470] "Ma io non crederò che ci sia tal dimostratione, fin che non mi sia mostrata" (*ibid*). We depart here from Blackwell's translation: "But I do not believe that there is such a demonstration, for it has not been shown to me," for two reasons: (1) the verb crederò is future and should be translated: "I will not believe" as opposed to "I do not believe," and (2) "fin" should be translated "until," not "for it has not." Normally "fino" is chosen, as it is in modern Italian, but classical Italian often left off the final "o." The correct translation of Bellarmine's words, then, are: "But I will not believe that there is such a demonstration until (or, until such time as) it is shown to me," which Fantoli adopts from Finocchiaro (*Galileo: For Copernicanism and for the Church*, pp. 184, 187).

> earth in the heavens saves the appearances is not the same thing as to demonstrate that in truth the sun is located in the center and the earth in the heavens. The first demonstration, I believe, can be given; but I have the greatest doubts about the second. And in case of doubt one should not abandon the Sacred Scriptures as interpreted by the Holy Fathers.[471] Let me add that the words, 'The sun rises and sets, and returns to its place…' were written by Solomon, who not only spoke as inspired by God, but who also was a man more wise and learned than all others in the human sciences and in the knowledge of created things, and all this wisdom he had from God.[472] Thus it is not likely that he would assert something which was contrary to demonstrated truth or to what could be demonstrated.[473] You might tell me that Solomon spoke according to appearances, since it appears to us that the sun revolves* when the earth turns, just as it appears to one on a ship who departs from the shore that the shore departs from the ship. To this I respond that, although to him who departs from the shore it does seem that the shore departs from him, nevertheless he knows that this is an error and he corrects it,[474] seeing clearly that the ship moves and not the shore. But in respect to the sun and the earth, there has never been any wise person who felt a need to correct such an error, because one clearly experiences that the earth stands still, and the eye is not mistaken when it judges that the sun moves, just as it is not mistaken when it judges that the moon and the stars move.[475] And this is enough for now. With cordial greetings, Reverend Father, and I pray for every blessing from God.[476]

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[471] "…et in caso di dubbio non si dee lasciare la Scrittura Santa, esposta da' Santi Padri" (*ibid.*).

[472] "fu Salomone, il quale non solo parlò inspirato da Dio, ma fu huomo sopra tutti gli altri sapientissimo e dottissimo nelle scienze humane e nella cognitione delle cose create, e tutta questa sapienza l'hebbe da Dio" (*ibid.*).

[473] "…o che si potesse dimostrare." (*ibid.*).

[474] "…nondimeno conosce che questo è errore e lo corregge" (*ibid.*).

[475] "ma quanto al sole e la terra, nessuno savio è che habbia bisogno di correggere l'errore, perchè chiaramente esperimenta che la terra sta ferma e che l'occhio non s'inganna quando giudica che il sole si muove, come anco non s'inganna quando giudica che la luna e le stele si muovano." (*ibid.*).

[476] As translated by Richard Blackwell in *Galileo, Bellarmine and the Bible*, pp. 265-267, except for "fin" noted above, in addition to the word "rotates" which has been replaced by "revolves." Underlining has been added to emphasize the salient points.

Roberto Card.le Bellarmino.

As was his usual style, Bellarmine answered Foscarini with the same erudition that made him famous in other ecclesiastical and scholarly matters. This was not an answer that tried to stall or placate the objector. It was very straightforward and resolute. Simply put, Foscarini posed an alternate scenario to what had been believed up to that time and Bellarmine told him clearly that it had no merit and was to be rejected. He offered no compromise. Indeed, there could be none, for there were only two possibilities: either the Earth moves or it does not move. Bellarmine saw no convincing arguments that would force the Church to conclude that it had been wrong for fifteen centuries about the Earth's position in space. As McMullin rightly notes:

> Did he think that a demonstration might conceivably be found? It seems altogether unlikely that he did. Nor was his concession an evidence of open-mindedness with regard to this issue; it was evidence only of the innate courtesy for which Bellarmine was famous. He went on in the remainder of the letter to list several reasons why such a proof would not be forthcoming. Mathematical astronomy, the genre to which he thought Copernicus's constructions to belong, was inherently incapable of producing such a proof; the best it could do was to save the appearances….This had been Bellarmine's view when teaching astronomy long before in Louvain….He had not changed his mind in the years since….If Bellarmine, solicitous for the reputation of the Church as he was, had believed that there was the slightest possibility that the Copernican ordering of sun and earth might later prove correct, he would never have allowed the decree of 1616 to go through.[477]

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[477] "The Church's Ban on Copernicanism," in *The Church and Galileo*, pp. 180-181. We quote McMullin only because he correctly assesses Bellarmine's absolute resolve on the issue, for McMullin himself holds that "He [Bellarmine] was wrong, and Galileo was right" (*ibid.*, p. 181), since he believes modern science has proven heliocentrism.

Fr. George Coyne, in one of four criticisms of John Paul II's 1992 speech, expressed a similar conclusion:

> From the concluding sentences of the Letter it is clear that Bellarmine was convinced that there could be no demonstration of Copernicanism. A further indication of this conviction on Bellarmine's part is that he supported the Decree of the Congregation of the Index, which was aimed at excluding any reconciliation of Copernicanism with Scripture. If he truly believed that there might be a demonstration of Copernicanism, would he not have recommended waiting and not taking a stand, a position embraced at that time, it appears, by Cardinals Barberini and Caetani? And why did he agree to deliver the injunction to Galileo in 1616? This injunction prohibited Galileo from pursuing his research as regards Copernicanism. Galileo was forbidden to seek precisely those scientific demonstrations, which, according to Bellarmine, would have driven theologians back to reinterpret Scripture.[478]

Annibale Fantoli sees it the same way:

> As we know, Bellarmine in his response to Foscarini had faced the possibility, although with a considerable and basic skepticism, that a proof for Copernicanism might be given. But by signing, as he did, the ecclesiastical decisions of February-March 1616, he had himself by now come to preclude completely that possibility, however tenuous it might be. And, I repeat, the other Churchmen were also precluding it. Therefore, to hold that the provisions of 1616 were only intended to break the untimely zeal of Galileo for Copernicanism without blocking further careful scientific research on the matter appears to me to be completely untenable.[479]

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[478] Lecture by Coyne, delivered at a conference titled: "The Galileo Case: Did the Church Make a Mistake?" held at the Polish Academy of Learning in Cracow, Nov. 14, 2002.

[479] *Galileo: For Copernicanism and the Church*, p. 481. Fantoli, Coyne and McMullin naturally think that Bellarmine's throwing down of the gauntlet ruined the Church's standing in the world, as does Richard Westfall, stating: "The net result of Cardinal Bellarmine's devoted effort to defend his Church was to place an incubus to its back that it struggles still to shake off" (*Essays on the Trial of Galileo*, Vatican City: Vatican Observatory Publications, 1989, p. 24). That conclusion, of course, would only be valid if Bellarmine was proven wrong and Copernicanism proven right.

Most importantly, Bellarmine assures Foscarini that he is well aware of the "many ways of interpreting the Holy Scriptures," but he implores Foscarini to become equally aware that no one can arbitrarily decide when a less than literal interpretation can be applied. Bellarmine reiterates over and over again in his letter that the all-important decision on when and where it is permissible to apply a non-literal interpretation to Scripture has been left to more divinely qualified and authoritative minds than Foscarini's. In effect, Bellarmine informs Foscarini that the decision on the meaning and intent of Scripture has already been made. The die is cast and cannot be changed. Bellarmine appeals to the witness of Solomon as his foundation, a man both inspired by the Holy Spirit and given the supernatural gift of wisdom and knowledge above all others. Although Bellarmine agrees that on certain occasions it was more convenient for various writers of Scripture to speak in the language of appearance and thus we should interpret their words accordingly, there are many cases in which this hermeneutic cannot be applied. Surely Solomon, whose writings are permeated with a scientific analysis of life, would not suddenly become unscientific when he was describing the cosmos. Similarly, the Fathers, who read both the heliocentric arguments from the Pythagorean school as well as the geocentric arguments from the Aristotelian school and thus had the option of interpreting Scripture's cosmological passages either phenomenally or realistically, chose the latter, without equivocation or debate amongst themselves. From Moses, through Solomon, to the Holy Fathers, and even to the magisterium of the Church, Bellarmine informs Foscarini "there has never been any wise person who felt the need to correct such an error." The burden of proof, then, rested solely on the objector to the literal hermeneutic, and what a tremendous burden it was.

Some have posited that Bellarmine was not being very scientific when he said: "one clearly experiences that the earth stands still, and the eye is not mistaken when it judges that the sun moves" as if were saying that one could know the Earth is motionless merely by standing on it. Such is not the case, however. Bellarmine is giving an *a posteriori* argument based on his previous *a priori* argument. That is, Bellarmine can say that he "knows" the Earth is motionless only because revelation and tradition have told him so, and it is only then that he can "clearly experience" the Earth standing still when he sees the sun, moon, and stars go around it. Obviously, he could not know the Earth is motionless without such revelation if, as he admitted earlier in the paragraph, either celestial option is possible based on pure relative motion.

Bellarmine advances these kinds of arguments because they were formulated earlier in his work, *De controversiis*, the treatise in which he outlined the principles of Scripture interpretation that were to guide the Church through the Protestant revolt and beyond:

> Scripture is the immediately revealed word of God, and was written as dictated by God…. Thus we say that the sacred writers had immediate revelation and wrote the words of God himself either because new things previously unknown were revealed to them by God…or because God immediately inspired and moved them to write things which they had seen or heard, and guided them lest they err in any way…
>
> There can be no error in Scripture, whether it deals with faith or with morals, or whether it states something general and common to the whole Church or something particular and pertaining to only one person.
>
> In the Scriptures not only the opinions expressed but each and every word pertains to the faith. For we believe that not one word in Scripture is useless or not used correctly.[480]
>
> In Scripture there are many things which of themselves do not pertain to the faith, that is, which were not written because it is necessary to believe them. But it is necessary to believe them because they were written, as is evident in all the histories of the Old Testament, in the many histories in the Gospel and in the Acts of the Apostles, in the greetings of Paul in his Epistles, and in other such things.[481]

We notice also that Bellarmine's argument to Foscarini does not center around whether it might be theoretically possible to interpret the geocentric passages of Scripture phenomenally. Bellarmine fully concedes that, in the art of hermeneutics, a non-literal or "as it appears" interpretation of a biblical passage is fully within the realm of theoretical possibility. Instead, Bellarmine's argument centers on whether we have the divine directive to do so. The answer to that question is an unequivocal no. This is precisely why Bellarmine can put himself on the line, as it were, and declare, in essence, that there is no scientific proof for heliocentrism: "But I will not believe there is such a demonstration until it is shown to me." Five hundred years of scientific endeavor following Bellarmine's bold declaration has shown him to be absolutely correct, for no scientist has ever proven that the Earth moves. Indeed, many experiments show the Earth is standing still in space.

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[480] *De controversiis*, II, II, 12, as found in Roberto Cardinal Bellarmino, S.J., *Opera omnia*, cited in Blackwell's *Galileo, Bellarmine and the Bible*, p. 31.
[481] *De controversiis*, I, I, 4, 12, *ibid*., p. 32.

Last but not least, Bellarmine assures Foscarini that the matter of whether the sun revolves around the Earth is certainly a "matter of faith." As McMullin notes:

> But now a new note was struck, one that would doom one of Galileo's main lines of defense. It might *seem* as though the sun's motion and the earth's rest were not matters of faith, he wrote. But they were because of the speaker – that is, because the text of the Bible as a whole had God as its primary author. Thus every passage with a clear literal intent (and Bellarmine always assumed that the earth/sun passages displayed such an intent) had the same status: it was a matter of faith. To challenge it would be, implicitly, to challenge the divine authorship of Scripture, and that was *explicitly* a matter of faith: it would be as "heretical to say that Abraham did not have two children" as to say that "Christ was not born of a virgin."[482]

As for Foscarini, since he had already published his book, it could not be corrected; and thus the Church's only choice was to condemn it, and it did so on March 5, 1616.[483] Foscarini died just three months later on June 10, 1616, although the date is uncertain.

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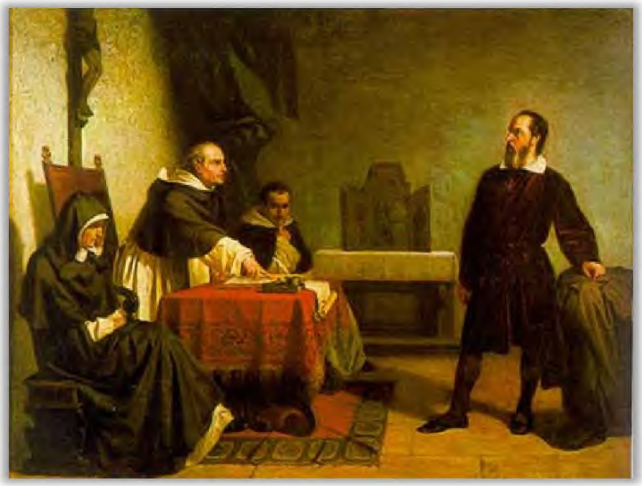
[482] "The Church's Ban on Copernicanism," in *The Church and Galileo*, p. 179, emphasis in original. (NB: Abraham actually had more than two children, since he had at least six more with Keturah (Gn 25:1-2), but Bellarmine was only referring to the sons Abraham had with Hagar and Sarah, respectively). McMullin adds: "This extreme form of biblical literalism was not peculiar to Bellarmine, of course. It is best understood as the fruit of the bitter years of controversy between the Reform and the Counter-Reform, controversy in which Bellarmine himself played a leading role" (*ibid.*). What McMullin fails to consider, however, is that the same form of "extreme literalism" allowed Bellarmine to defend sacramental theology against Protestant attempts to deliteralize the interpretation of such passages as John 3:5; 6:53; 20:23 dealing with Baptism, the Eucharist and Confession, respectively.

[483] Foscarini published his work in Naples in 1615, titled: *Lettra Sopra L'Opinione de' Pittagorici e del Copernico, della Mobilita della Terra e Stabilita del Sole, e il Nuovo Pittagorico Sistema del Mondo*.

The Church Confronts Galileo Galilei

The Church's case against Galileo was quite strong. The Fathers, the medievals, the Tridentine catechism, the doctors, the saints, the tradition of literal interpretation of Scriptue; and the fact that Galileo had no convincing scientific arguments to prove his position, was insurmountable. As Cardinal Joseph Ratzinger (Pope Benedict XVI), quoting Feyerabend, once stated:



> At the time of Galileo the Church remained much more faithful to reason than Galileo himself. The process against Galileo was reasonable and just.[484]

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[484] From a speech given in Parma, Italy, March 15, 1990, partly reported in *Il Sabato*, March 31, 1990, pp. 80ff, and in the *Corriere della Sera*, March 30, 1990, and cited in *30 Days*, January 1993, p. 34, and referenced also by Atila S. Guimarães in "The Swan Song of Galileo's Myth," published by *Tradition in Action*, nd. Paul Feyerabend notes: "Cardinal Joseph Ratzinger, who holds a position similar to that once held by Bellarmine, formulated the problem in a way that would make a revision of the judgement [against Galileo] anachronistic and pointless. *Cf.* his talk in Parma of 15 March 1990….As witnesses the Cardinal quoted Ernst Bloch ('being merely a matter of convenience the scientific choice between geocentrism and heliocentrism cannot overrule the practical and religious centricity of the earth'), C. F. von Weizsäcker ('Galileo leads directly to the atom bomb') and myself (the chapter heading of the present chapter)" (*Against Method*, 3rd edition, Verso, London, New York, 1975, 1996, p. 134). Feyerabend's "chapter heading" states: "The Church at the time of Galileo not only kept closer to reason as defined then and, in part, even now; it also considered the ethical and social

By the same token, Feyerabend notices the tremendous difference between how the modern Church handles scientific claims and how the Church of Galileo's day handled them. In a 1982 letter Feyerabend wrote to a Catholic priest who attended a debate in Zürich on the "the modern relation between the sciences and the Catholic Church," he remarks:

> Dear Father Rupert, I listened with interest to your talk of Thursday last. I was surprised by two features. The one is the speed with which the Church now retreats in the face of scientific results….When I was a student I revered the sciences and mocked religion and I felt rather grand doing that. Now that I take a closer look at the matter I am surprised to find how many dignitaries of the Church take seriously the superficial arguments I and my friends once used, and how ready they are to reduce their faith accordingly. In this they treat the sciences as if they, too, formed a Church…Best wishes, Paul Feyerabend.[485]

Other secular sources also recognize the distinction. In a letter from Thomas Huxley (d. 1895) to Catholic scholar George Mivart, he writes: "I looked into the [Galileo] matter when I was in Italy, and I arrived at the conclusion that the pope and the college of cardinals had rather the best of it."[486] That is quite an admission from a man who devoted himself to agnosticism and evolution for his entire scientific career. Historically speaking, what the "best of it" might include is that the Church of both 1616 and 1633 looked into every nook and cranny of Galileo's claims and found them not only highly erroneous but also "formally heretical."[487]

One can only begin to appreciate the seriousness with which the Church confronted the issue of whether the Earth revolved around the sun if he contemplates the actual number of documents that are catalogued in its archives on the Galileo affair, especially the manner in which these documents carry the official and solemn declarations of the pope and his Congregation of the Holy Office. Recent requisitions of the official

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consequences of Galileo's views. Its indictment of Galileo was rational and only opportunism and a lack of perspective can demand a revision" (*ibid*., p. 125).

[485] Paul Feyerabend, *Farewell to Reason*, pp. 263-264.

[486] T. H. Huxley, Letters and Diary 1885, Nov. 12, 1885. Huxley's comment is also cited in the *Catholic Encyclopedia* article on Galileo: "and Professor Huxley after examining the case avowed his opinion that the opponents of Galileo 'had rather the best of it'" (Robert Appleton and Co, 1910, Vol. VI, p. 344).

[487] The 1633 sentence against Galileo stated that heliocentrism was: è propositione assurda e falsa in filosofia, e formalmente heretica ("an absurd proposition and false in philosophy and formally heretical") cited in *Galileo E L'Inquisizione*, Favaro, p. 143.

records of the Inquisition that are contained in the Vatican archives reveal over 7,900 separate documents, and these are what remain after many had already been destroyed or confiscated. Many of them have never been read once they were put in storage.[488] In addition to the official documents are the unofficial ones, including personal letters back and forth between the major participants in the Galileo affair.[489] With such tremendous volumes of written material traversing back and forth through Europe, not to mention the unrecorded public or private conversations that occurred on a daily basis, it is no stretch of the imagination to conclude that the Church considered the issue of solar cosmology one of the most important it had ever faced, perhaps close to the Trinitarian or Christological disputes that occurred in its early centuries, or the matters regarding Salvation during the Protestant revolt. Although each of these doctrinal issues certainly had its own specific concerns, in general they all had one simple and common thread: how do we interpret the words of Scripture; and if there is a dispute, who has the final say on which interpretation is correct?

The matter of biblical interpretation was never made more pertinent than it was in the Galileo affair. Few of the participants got bogged down in theological minutia as they had in the early centuries of Christianity when they attempted to discern how three persons could exist in one God, or why St. Paul said a man was not justified by works (Rm 3:28) but St. James insisted that he was (Jm 2:24). The Galileo case was a simple matter of deciding, out of two equally plausible options of viewing the cosmos, neither of which had been proven scientifically, whether to interpret Scripture literally or figuratively. As we have documented, the Church clearly came down on the side of literal interpretation, and the rest of the Galileo affair is mere detail. Galileo knew this fact quite early in the game. On July 7, 1612, he received a letter from Cardinal Carlo Conti, prefect of the Holy Office, which more or less gave the official view on the matter of Scripture interpretation, specifically concerning whether Aristotelian principles were based on sound scriptural exegesis. Conti admits that neither Scripture nor the Fathers endorse such Aristotelian notions as the incorruptibility of the heavens,[490] but in regard to a moving sun around the Earth, both sources confirmed it as factual:

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[488] The best summary of the documentation on Vatican record keeping during the Inquisition is Francesco Beretta's "The Documents of Galileo's Trial: Recent Hypothesis and Historical Criticism" in *The Church and Galileo*, editor Ernan McMullin, pp. 191-212.

[489] Favaro has assembled twenty volumes of such official and unofficial correspondence, most averaging over 500 pages in each volume, in his massive *Le Opere di Galileo Galilei*, originally published in 1909, and republished in 1968.

[490] Original Italian: "In quanto poi a quello che me rechiede, se la Scrittura Sacra favorisca a principii de Aristotele intorno la constitutione dell' universo; se V.S.

> Because, although those passages stating that the earth is firm and immovable can be understood as signifying the perpetuity of the earth, as Lorini noted in the place already cited, nevertheless, where it says that the sun revolves and the heavens move, the Scripture cannot be interpreted in any sense other than that which corresponds to the popular, common usage…Nevertheless, Diego Stunica says, regarding the ninth chapter of Job, verse 6, says that it is more in conformity to Scripture to have the Earth move, although his interpretation is not commonly followed. This is what it has been possible to discover up to this moment on the subject. But when your eminence [Galileo] desires some further clarification regarding the other Scriptural passages, please let me know and I shall send you a response.[491]

Note that four years before his confrontation with Bellarmine, Galileo got word of the party line, as it were. The significant aspect of Conti's answer is, although the Church was willing to bend a little and say that the scriptural passages concerning the fixity of the Earth might possibly be interpreted as referring to the Earth's steadfast existence in time as opposed to space (as Lorini suggested), still, the passages concerning the movement of the sun and stars around the Earth could not have a meaning beyond what had been commonly interpreted. Conti's distinction would play itself out both in 1616 and again in 1633, since assertions advocating

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parla dell' incorrottibilità del cielo, some pare che accenni nella sua, dicendo scoprirse ogni giorno nove cose nel cielo, le respondo non essere dubbio alcuno che la Scrittura non favorisce ad Aristotele, anzi più tosto alla sentenza contraria, sì che fu commune opinione de' Padri che il cielo fosse corruttibile" (*Le Opere di Galileo Galilei*, Vol. 11, p. 354).

[491] Original Italian: "Perchè, se bene quei luoghi dove se dice che la terra stii stabile et ferma, si possono intendere della perpetuità della terra, come notò Lorino nel luogo citato, nondimeno dove si dece che il sole giri et i ciele si movono, non puole havere altra interpretatione la Scrittura, se non che parli conforme al comun modo del volgo… Nondimeno Diego Stunica, sopra il nono capo di Giob, al versetto 6, dice essere più conforme alla Scrittura moversi la terra, ancor che comunemente la sua interpretatione non sia seguita. Che è quello si è potuto trovare fin hora in questo proposito; se ben quando V. S. desideri di havere altra chiarezza d'altri luoghi della Scrittura, me lo avisi, chè gli lo mandarò" (*Le Opere di Galileo Galilei*, Vol. 11, p. 355). The ellipsis contains a difficult and possibly a textually corrupt statement: "il qual modo d'interpretare, senza gran necessità non non si deve ammettere." The double negative (non non) renders it non sensical. With only one negative Conti may be saying: "But such interpretation are not to be admitted without great necessity."

that the Earth moved were put in the category of "erroneous in faith" while those asserting the sun's immobility were placed in the higher category of "formally heretical."

Bellarmine himself was also very critical of Aristotelian cosmology,[492] but when it came to the case of whether the Earth was fixed and the sun moved, as far as he was concerned Aristotle had little to do with the question of its veracity. In essence, Scripture was the judge of Aristotle, Ptolemy, Copernicus, Galileo and any other aspiring cosmologist. As McMullin notes: "The habitual literalism of the Fathers in their use of the Bible as a source of cosmological knowledge he [Bellarmine] never questioned."[493] On what basis *could* he question it, since the Council of Trent, probably the most dogmatic and incisive set of official documents the Catholic Church has ever produced, had told him quite clearly just fifty years earlier that the Church had the final say on biblical interpretation and she took her marching orders from the consensus of the patristic witness? Bellarmine had already put these principles into practice in the case of Giordano Bruno sixteen years earlier, having been one of the judges at his trial.

Excursus on Giordano Bruno

Among Giordano's more heretical ideas was pantheism, although he later rejected it for a more deterministic system in which "graded animate monads" were given some independence from the "informing" Source. He believed the "transcendent God" is known by faith, but the immanent is reflected in numerous animate unities that constitute reality. Bruno had a great influence on Spinoza, Leibniz and Descartes.[494] The work that brought Bruno before the Inquisition was *Spaccio de la Destia Trionphante*, which "attacked all religions of mere credulity as opposed to religions of truth and deeds."[495] It was a biting attack on the Roman Church. At the time, Bruno was in England, living at the same time as William Shakespeare,[496] but Shakespeare was a firm geocentrist, as noted in such passages as *Troilus and Cressida*, Act 1, scene 3; King John, Act

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[492] Here we side with Blackwell who says that Santillana's claim that "Bellarmine was semiconsciously frightened by a problem he had never faced: What if the Aristotelian substructure were to prove unreliable?" is "nonsense" (*Galileo, Bellarmine and the Bible*, p. 45).

[493] "The Church's Ban on Copernicanism," in *The Church and Galileo*, p. 177.

[494] *Encyclopedia of Religion*, p. 90.

[495] Dorothy Stimson, *The Gradual Acceptance of the Copernican Theory*, p. 50, from J. Lewis McIntyre, *Giordano Bruno*, London, 1903, pp. 16-40.

[496] Robert Beyersdorf, *Giordano Bruno and Shakespeare*, Leipsic, 1889, pp. 8-36.

III, scene 1; and *Merry Wives*, Act III, scene 2,[497] and he was a devout Catholic as well.

Bruno was steeped in medieval mysticism and magic. He did not depend on observations and had an aversion to mathematics. He believed the Earth revolved around the sun not from any scientific observations but because he believed the Earth was alive, which, as an organism, it had local motion. Similarly, Bruno's belief in an infinite universe was not based on any scientific observations or theories, but from his belief that since God is infinite the universe must also be infinite. In his 1584 book, *On the Infinite Universe and Worlds*, he wrote: "Thus is the excellence of God magnified and the greatness of his kingdom made manifest; he is glorified not in one, but in countless suns; not in a single earth, a single world, but in a thousand thousand, I say in an infinity of worlds." Bruno also believed that there was an infinite number of planets with beings that inhabited them.

Frances Yates, the Oxford scholar, investigated the original manuscripts at the Warburg Institute in London and determined that, based on the heliocentric theory, Bruno believed he could call down power from the sun. The Inquisition discovered that his plan was to reconcile Catholics and Protestants by recourse to Egyptian Sun-worship (and associated with the Greek god, Hermes). Bruno also sought the use of magic and astro-empowered images to achieve this goal. As such, the Freemasons and Kabbalistic Jews of the French Revolution idolized Bruno and carried his bust in street processions. Yates shows that much of Renaissance and Post-Renaissance science was based on magic and the occult. Yates also believed Bruno was executed, although she admits there is no official Vatican record of it.[498] In the end, the Church found Bruno guilty of eight heresies, but since the documents concerning his final trial were destroyed in the 1800s, the precise heresies are not known. The final sentence, handed down by the Inquisition in early 1600, mentioned Bruno's eight heresies and then stated: "We hereby, in these documents, publish, announce, pronounce, sentence, and declare thee the aforesaid Brother Giordano Bruno to be an impenitent and pertinacious heretic, and therefore to have incurred all the ecclesiastical censures and pains of the Holy Canon, the laws and the constitutions, both general and particular, imposed on such confessed impenitent pertinacious and obstinate heretics....We ordain and command that thou must be delivered to the Secular Court...that thou mayest be punished with the punishment deserved....Furthermore, we condemn, we reprobate, and we prohibit all thine aforesaid and thy other books and writings as heretical and erroneous, containing many heresies and errors, and we ordain that all of them which have come or may in future come into the hands of the Holy Office shall be publicly destroyed and burned in the square of St. Peter before the steps and that they shall be placed upon the Index of Forbidden Books, and as we have commanded, so shall it be done....Thus pronounce we, the undermentioned Cardinal General Inquisitors."

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[497] Stimson, *op. cit.*

[498] Frances A. Yates, *Giordano Bruno and the Hermetic Tradition*, University of Chicago Press, 1964, 1991, p. 349

Despite Yates' belief, there is evidence leading to the conclusion that Bruno was never executed, least of all by Catholic authorities. According to one source: "The whole story is based on an alleged letter from Gaspard Schopp to his friend Conrad Rittenshausen, dated in Rome, Feb. 17, 1600…This letter was 'found' by a Lutheran pastor, Jean-Henri Ursin (1608-1667) in a book printed in Germany, a very rare book with a pseudonym for the author, as well as a false date and place of publication. No one has ever seen the original letter….No contemporary of Bruno's in Rome in 1600 ever mentioned an execution. Bruno was very famous throughout Europe, and his death, especially at the stake in Rome, would not go unnoticed, particularly by Protestant authors who would certainly have been all too happy to denounce Catholic intolerance. Moreover, there is absolutely no record of a trial or of any sentence against Bruno. All that is known is, after spending six years (1592-1598) in Venetian jails, Bruno came back to Rome. He might have been put under house arrest in some monastery, but no one knows how he died. Strangely enough, it is only from 1701 onwards that the story of Giordano Bruno made headlines, but without any new evidence about his fate….Pierre Bayle (1647-1706) the famous author of the *Dictionnaire historique et critique*…in his article on Bruno says he does not believe he was executed since the only source is Schopp's letter, which he considers a fake. In addition, Moreri (1643-1680), who wrote the *Grand Dictionnaire Historique*, does not believe Bruno was executed. Last but not least, the Venetian ambassadors in their diplomatic dispatches to the government never mentioned an execution of Bruno, yet he spent six years in their jails."[499]

End of excursus

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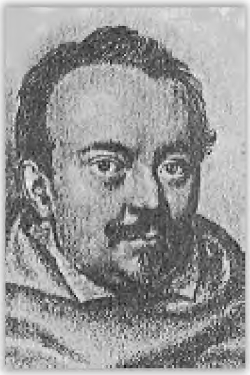
[499] Claude Eon, letter on file, November 2005, gleaned from the 1885 work of Théophile Desdouits.

Giovanni Ciampoli had warned Galileo of the biblical principles from the mouths of both Cardinal Barberini and Cardinal Bellarmine. In two letters to Galileo written in early 1615, he states:



> Cardinal Barberini, who, as you know from experience, has always admired your competency, told me just last evening that in regard to these opinions he would advise greater caution in not going beyond the arguments of Ptolemy or Copernicus, and ultimately in not exceeding the limits of physics and mathematics, because the explication of the Scriptures is restricted to theologians who deal with such matters, and if new things are introduced, even though admired for their ingenuity, not everyone has the unbiased ability of regarding them just as they are said….Surely we can attest to having to remit to the authority of those who have jurisdiction over human reason in the interpretation of the Scriptures, and it is most necessary on this occasion due to other people's malice.[500]

> Signor Cardinal Bellarmine…he concluded that there should be no contradiction when one treats the system of Copernicus and his demonstrations without entering into Scripture, the interpretation of which is reserved to the professors of theology who are approved by the public authority.[501]

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[500] Cardinal Barberino, il quale, come ella sa per esperienza, ha sempre ammirato il suo valore, mi diceva pure hiersera, che stimerebbe in queste opinioni maggior cautela il non uscir delle ragioni di Ptolemy o del Copernicus, o finalmente che non eccedessero I limiti fisici o mathematici, perchè il dichiarar le Scritture pretendono I theology che tochhi a loro; e quando di porti novità, ben che per ingegno ammiranda, non ogn' uno ha il cuore senza passione, che voglia prender le cose come son dette….Sì che l' attestare spesso di reimettersi all' autorità di quei che hanno iurisditione sopra gl' intelletti humani nell' interpretationi delle Scritture, è necessarissimo per levar questa occasione all' altrui malignità (*Le Opere di Galileo Galilei*, vol. 12, p. 146).

[501] S. Card. Bellarmino…e ci concludeva che quando ella tratterà del sistema Copernicano e delle sue dimostrationi senza entrare nelle Scritture, la interpretatione delle quali vogliono che sia riservata a I professori di theologia approvati con publica autorità, non ci doverà essere contrarietà veruna. (March 21, 1615, *Le Opere di Galileo Galilei*, vol. 12, p. 160).

As it stands, the Galileo affair was just another tool that allowed the Church to reaffirm the same literal interpretation of Scripture that it had employed in all previous centuries. In that sense, Galileo was a welcome thorn that woke the sleeping giant. All the Church's doctrines (the Trinity, the Incarnation, original sin, transubstantiation, baptismal regeneration, hell, the bodily resurrection, *etc*.) were based on the literal interpretation of Scripture, and almost always in the face of objections from outsiders that it was absurd to interpret Scripture literally in such cases. The Church maintained, and the Galileo issue brought it out once again, that except for very obvious instances in which Scripture should not be interpreted literally, literal interpretation was to reign in all biblical exegesis, just as it had since the beginning of the Church. To depart from it one had to have an irrefutable reason for doing so, and no one either then or now could provide such a reason. As even Paul Feyerabend has defended the actions of the Church against Galileo:

> Besides, the Church, and by this I mean its most outstanding spokesmen…did not say: what contradicts the Bible as interpreted by us must go, no matter how strong the scientific reasons in its favor. A truth supported by scientific reasoning was not pushed aside. It was used to revise the interpretation of the Bible passages apparently inconsistent with it. There are many Bible passages which seem to suggest a flat earth. Yet Church doctrine accepted the spherical earth as a matter of course. On the other hand the Church was not ready to change just because somebody had produced some vague guesses. It wanted *proof* – scientific proof in scientific matters. Here it acted no differently from modern scientific institutions: universities, schools and even research institutes in various countries usually wait a long time before they incorporate new ideas into their curricula…But there was as yet no convincing proof of the Copernican doctrine. Hence Galileo was advised to teach Copernicus *as a hypothesis*; he was forbidden to teach it *as a truth*.
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> This distinction has survived until today. But while the Church was prepared to admit that some theories might be true and even that Copernicus' might be true, given sufficient evidence,[502]

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[502] Here Feyerabend footnotes the letter Bellarmine wrote to Foscarini saying: "…if there were a true demonstration…that the sun does not circle the earth but the earth circles the sun, then we would have to proceed with great care in explaining the Scriptures that appear contrary, and say rather that we do not

there are now many scientists, especially in high energy physics, who view all theories as instruments of prediction and reject truth-talk as being metaphysical and speculative. Their reason is that the devices they use are so obviously designed for calculating purposes and that theoretical approaches so clearly depend on considerations of elegance and easy applicability that the generalization seems to make good sense. Besides, the formal properties of 'approximations' often different from those of the basic principles, many theories are first steps towards a new point of view which at some future time may yield them as approximations and a direct inference from theory to reality is therefore rather naïve.[503] All this was known to 16th and 17th century scientists. Only a few astronomers thought of deferents and epicycles as real roads in the sky; most regarded them as roads on paper which might aid calculation but which had no counterpart in reality. The Copernican point of view was widely interpreted in the same way – as an interesting, novel and rather efficient model. The Church requested, both for scientific and for ethical reasons, that Galileo accept this interpretation. Considering the difficulties the model faced when regarded as a description of reality, we must admit that 'logic was on the side of…Bellarmine and not on the side of Galileo,' as the historian of science and physical chemist Pierre Duhem wrote in an interesting essay.[504]

To sum up: the judgment of the Church experts was scientifically correct and had the right social intention, *viz*., to protect people from the machinations of specialists. It wanted to protect people from being corrupted by a narrow ideology that might work in restricted domains but was incapable of sustaining a harmonious life. A revision of the judgment might win the Church some friends among scientists but would severely impair its function as a preserver of important human and superhuman values.[505]

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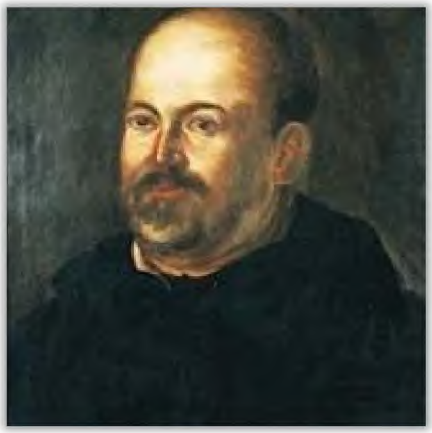
understand them than that what is demonstrated is false. But I will not believe there is a demonstration until it is shown me."

[503] Here Feyerabend includes a footnote to the book *How the Laws of Physics Lie* by Nancy Cartwright, Oxford, 1983.

[504] Here Feyerabend cites Duhem's book, *To Save the Phenomena*, 1963, p. 78

[505] Paul Feyerabend, *Against Method*, pp. 132-133.

Galileo's Letter to Benedetto Castelli



We can obtain an enlightening view of Galileo's treatment of Scripture in his letter to **Benedetto Castelli** of December 21, 1613. He writes:

> **Galileo**: In regard to the Grand Duchess' first general question, I agree, as you most prudently proposed, conceded, and established, that it is not possible for Sacred Scripture ever to deceive or to err; rather its decrees have absolute and inviolable truth. Only I would have added that, although Scripture itself cannot err, nevertheless some of its interpreters and expositors can sometimes err, and in various ways. The most serious and most frequent of these errors occurs when they wish to maintain always the direct meaning of the words, because from this there results not only various contradictions but even grave and blasphemous heresies.

Analysis: Although it is certainly possible to create a heresy by literally interpreting Scripture when it should be interpreted non-literally, in reality, few heresies have been created by such means. In actuality, the preponderance of Catholic dogmas have been forged by taking the words of Scripture in their "direct meaning." As noted, the Church would not have recognized the doctrine of baptismal regeneration had it not been decided that the words of Jesus in John 3:5 ("unless a man is born of water and the spirit he cannot enter the kingdom of God") should be interpreted literally. If the Church had not been guided by the Spirit of God it would have been very easy for her to conclude that John 3:5, and many other passages of Scripture, should be interpreted figuratively, not literally. In fact, the non-literal or symbolic interpretations of John 3:5 (*e.g.*, that water represents spiritual cleansing as opposed to being the actual agent for procuring salvation) are much easier for the average mind to accept and apply. Ostensibly, it seems rather primitive to believe that water carries salvific power, but that is, indeed, the only truth that the Church dogmatized, in spite of ridicule from the world, both then and now. The reason the Church made the decision not to interpret such passages figuratively is that she, by guidance from the Holy Spirit, had long ago made a prior commitment to the literal interpretation of Scripture. Unless there was a sufficient reason not to do so, the literal interpretation ruled all exegesis. In the end, it is the Church who decides when a non-literal interpretation can be applied. This is a very serious matter and it cannot be treated lightly. Inevitably, grave problems will arise when men of no ecclesiastical authority decide for themselves that a certain scriptural passage should be interpreted figuratively against the Church's insistence it be interpreted literally. It is then that heresies are created. When it came time to make a formal and final decision on how to interpret Scripture's cosmological passages, the Church decided, in accord with two thousand years of Hebrew exegesis and fifteen hundred years of Catholic exegesis, that in the case of deciding whether the sun went around the Earth or vice-versa, this was an instance that required literal interpretation. As Feyerabend notes: "The Church, being the foremost guardian and interpreter of the Bible, also made it a boundary condition of reality."[506] These principles were outlined in detail in Bellarmine's dealing with the topic of biblical interpretation in his famous *De controversiis*:

> Now that it has been established that Scripture is obscure and needs interpretation, another question arises; namely, whether the interpretation of Scripture should be sought from some one visible and common judge, or should be left to the judgment of each individual person. This is indeed a most serious question, and all controversies depend, as it were, on it…
>
> Certain preliminaries must be noted in order to understand what is being asked. The first of these concerns the meanings of Scripture. For it is a peculiarity of Scripture, since it has God as its author, that it very often contains two meanings, the literal or historical, and the spiritual or mystical. The literal meaning is the meaning which the words immediately present; the spiritual

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[506] Paul Feyerabend, *Farewell to Reason*, p. 253.

> meaning refers to something else other than that which the words immediately signify. This distinction is used by the Apostle in Corinthians 10:1f, where he says that everything that happened to the Jews is an example for our improvement. What is said about the exodus of the Jews from Egypt, the crossing of the sea, the manna rained in the desert, and the water which flowed from the rock, he applies spiritually to Christians. Also Jerome in *In Ezechielem*, Chapter 2, where he deals with the Apocalypse and Ezekiel 2, teaches that these two meanings are signified internally and externally by the written book….
>
> Furthermore there are two types of literal meaning: simple, which consists of the proper meanings of words; and figurative, in which words are transferred from their natural signification to another. There are as many types of the latter as there are types of figures. When the Lord says in John 10, "I have other sheep which are not of this fold," the meaning is literal; but the figurative meaning is that other men besides the Jews must be gathered into the Church, which is said properly at John 11; namely, that he would gather together in unity the children of God who were scattered. Regarding figurative locutions, see St. Augustine, *De doctrina christiana*, Book 3. But however this may be, spiritual meaning is not found in every sentence of Scripture, in neither the Old nor in the New Testament. For the words, "Love the Lord your God with all your heart," in Deuteronomy 6 and in Matthew 22, and similar precepts, have only one meaning, that is, the literal meaning, as Cassiano rightly teaches in *Collationes* 8, Chapter 3. This being so, we and our adversaries agree that effective arguments ought to be sought in the literal meaning alone. For it is certain that that meaning, which is taken immediately from the words, is the meaning of the Holy Spirit. But there are various mystical and spiritual meanings, and although they are edifying when they are not contrary to faith and good morals, nevertheless it is not always clear whether they were intended by the Holy Spirit…

In the following paragraph, Bellarmine shows that the Church's insistence on interpreting Scripture's cosmological passages literally is consistent and foundational to how she has interpreted Scripture's other difficult passages that one might be tempted to interpret non-literally:

> Doubts regarding the literal meaning itself arise occasionally for two reasons. The first is the ambiguity of words, as is seen in

Matthew 26, "Drink all of you from this." The words "all of you" are ambiguous, if only the words are examined. For it is not known whether this signifies all men absolutely, or only all the faithful, or all the apostles. The second and more serious case is the proper meaning of words. For since literal meaning is sometimes simple and sometimes figurative, as we said, it is doubtful in many places whether the true sense is simple or figurative. The words in Matthew 26, "This is my body," Catholics wish to be accepted simply according to the proper meaning of the words, but the followers of Zwingli take them in a metaphorical way. For this reason some have at times fallen into the gravest errors. An example is Origen who erred in this way by accepting figuratively what should have been taken simply, as Jerome teaches in his *Epistula ad Pammachium* concerning the error of John of Jerusalem…

Others have fallen into the contrary error of taking as simple and proper things which ought to be taken figuratively. An example is Papias, and those who followed him, Justinius, Irenaeus, Tertullian, Lactantius, and some others, who thought that what is said in Apocalypse 20, about the New Jerusalem and the thousand years in which the saints will reign with Christ, is to happen here on earth. Their error was condemned by Jerome in the preface to his *In Isaiam*, Book 18, and in *In Ezechielem*, Chapter 36, and by Augustine in his *De civitate Dei*, Book 20, Chapter 7.

Our adversaries agree with us that the Scriptures ought to be understood in the spirit in which they were written, that is, in the Holy Spirit. The Apostle Peter teaches this in 2 Peter 1, when he says, "Understand this first, that no prophecies are due to individual interpretation. For the prophecies are never derived from human effort; rather the holy men of God spoke as inspired by the Holy Spirit." By this St. Peter proves that the Scriptures ought not to be explained by the individual mind but according to the dictates of the Holy Spirit, because they were not written by the human mind but by the inspiration of the Holy Spirit.

The whole question, therefore, comes down to this: Where is that spirit? We maintain that, although this Spirit is often absent in many individual persons, still it is certainly to be found in the Church, that is, in a council of bishops established by the highest pastor of the whole Church, or in the highest pastor with a

> council of the other pastors. We do not wish to enter into a discussion here about the highest pontiff and councils, as to whether the pontiff alone or a council alone can define something. We will deal with this in its own place. Rather here we say in general that the judge of the true meaning of Scripture and of all controversies is the Church, that is, the pontiff with a council, on which all Catholics agree and which was expressly stated by the Council of Trent, Session 4.
>
> But all contemporary heretics teach that the Holy Spirit which interprets Scripture is not a group of bishops or of any other class of persons. Hence each individual ought to be the judge, either by following his own spirit if he has the gift of interpretation, or by committing himself to someone else whom he sees as having that gift…[507]

The same things that Bellarmine, Trent, and the popes to the present day wrote about the inspiration and inerrancy of Scripture were also expressed in the 1994 *Catechism of the Catholic Church*, published by John Paul II two years after he gave his speech to the Pontifical Academy of Science.

> Sacred Scripture is the speech of God as it is put down in writing under the breath of the Holy Spirit.[508]
>
> The task of giving an authentic interpretation of the Word of God, whether in its written form or in the form of Tradition, has been entrusted to the living, teaching office of the Church alone.[509]
>
> The Church's Magisterium exercises the authority it holds from Christ to the fullest extent when it defines dogmas, that is, when it proposes, in a form obliging the Christian people to an irrevocable adherence of faith, truths contained in divine

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[507] Bellarmine's *Disputations on the Controversies Over the Christian Faith Against the Heretics of the Day*, Controversy I: On the Word of God; Book 3: On the Interpretation of the Word of God; Chapter 3: The Question of the Judge of Controversies is Posed; also the Meanings of Scripture are Discussed, selected portions, as translated by Blackwell in *Galileo, Bellarmine and the Bible*, pp. 187-193, with my correction of "Corinthians 1:10" to "Corinthians 10:1f."

[508] *Catechism of the Catholic Church*, 2nd edition, Libreria Editrice Vaticana, 1994, 1997, ¶ 81.

[509] *Ibid.*, ¶ 85.

Revelation or also when it proposes, in a definitive way, truths having a necessary connection with these.[510]

It is clear therefore that, in the supremely wise arrangement of God, sacred Tradition, Sacred Scripture, and the Magisterium of the Church are so connected and associated that one of them cannot stand without the others. Working together, each in its own way, under the action of the one Holy Spirit, they all contribute effectively to the salvation of souls.[511]

God is the author of Sacred Scripture. The divinely revealed realities, which are contained and presented in the text of Sacred Scripture, have been written down under the inspiration of the Holy Spirit.[512]

The inspired books teach the truth. Since therefore all that the inspired authors or sacred writers affirm should be regarded as affirmed by the Holy Spirit, we must acknowledge that the books of Scripture firmly, faithful, and without error teach that truth which God, for the sake of our salvation, wished to see confided to the Sacred Scriptures.[513]

In Sacred Scripture, God speaks to man in a human way. To interpret Scripture correctly, the reader must be attentive to what the human authors truly wanted to affirm and to what God wanted to reveal to us by their words.[514]

In order to discover the *sacred authors' intention*, the reader must take into account the conditions of their time and culture, the literary genres in use at that time, and the modes of feeling, speaking, and narrating then current. For the fact is that truth is differently presented and expressed in the various types of historical writing, in prophetical and poetical texts, and in other forms of literary expression.[515]

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[510] *Ibid.*, ¶ 88.
[511] *Ibid.*, ¶ 95.
[512] *Ibid.*, ¶ 105.
[513] *Ibid.*, ¶ 107.
[514] *Ibid.*, ¶ 109.
[515] *Ibid.*, ¶ 110.

We pause here to notice that, unlike many liberal interpreters of Scripture who appeal to the "author's intention" as a rationale for asserting that Scripture could contain propositional errors in its "various types" of writing (a common belief among those in the Pontifical Academy of Science and other higher echelons of academia), the Catechism makes absolutely no mention of such a possibility, here or in any other paragraph of its 904 pages. In fact, liberal interpreters who have attempted to turn the Catechism's clause "for the sake of our salvation" (¶107) into an assertion that Scripture is only inerrant when it speaks about salvation,[516] should be quite shocked to find that the Catechism makes no mention of such a meaning or intent among the sacred authors. In fact, in paragraph 95 the Catechism states the same truth as paragraph 107 concerning the goal of salvation. It describes the outcome of the working together of Tradition, Scripture and the Magisterium: "they all contribute effectively to the salvation of souls."[517] The suggestion that "for the sake of our salvation" means that Scripture's inerrancy is limited to matters of salvation is one of the most erroneous impositions ever foisted on Scripture and the Catholic Church. The correct meaning, as it has been established in every document the Church has ever produced on the issue, is that Scripture was made inerrant precisely because God wanted man to have a flawless source of divine information upon which he can seek and secure his salvation. In actuality, the liberal exegete's continual appeal to the "author's intention" is merely a psychological ploy to implant the idea that the biblical author may not have intended to tell factual truth and thereby left himself room to make historical mistakes. Rather, he intended to be less than truthful about the occurrences of an historical event, or that he intended as fiction what actually appears to be an historical narrative.[518] But the Catechism admits to no such "intention" among the biblical authors. It merely states that the sacred author's intention should be taken into account, and rightly so. Obviously, an exegete would want to know whether the author was speaking in prose or poetry, metaphors or literalism, so that he can adjust his thinking about how the material is being communicated to him. But the Catechism does not, in any way, shape or form, state that the intention of the author may have been to allow errors of fact in his writing; that he wanted to be less than truthful concerning what occurred; or that he intended as fiction what is displayed as an actual event. In fact, in not one magisterial document ever produced by the Catholic Church is the "sacred author's intent" ever stated to include errors, fictions or fabrications in Scripture's historical narratives.

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[516] As we noted earlier, a good example of this new teaching are the works of the late Fr. Raymond Brown, editor of the *New Jerome Biblical Commentary*, and one of the most influential Catholic theologians in the world. He writes: "Scriptural teaching is truth without error to the extent that it conforms to the salvific purpose of God" (*New Jerome Biblical Commentary*, p. 1169). The Catholic Church has never officially taught Brown's view of biblical interpretation.

[517] *Ibid.*, ¶ 95.

[518] For example, Raymond Brown writes: "If one correctly classifies a certain part of the Bible as fiction, one is not destroying the historicity of that section, for it never was history; one is simply recognizing the author's intention in writing that section" (*The New Jerome Biblical Commentary*, p. 1152). Of course, what Brown hasn't determined to anyone's satisfaction is *how* one "correctly classifies a certain part of the Bible as fiction." The only certain way this could be done is if the Bible itself states that a certain narrative is fictional (*e.g.*, parables). All other attempts at determining fiction in the Bible are totally subjective and without the slightest proof. This issue becomes all the more egregious when exegetes such as

The Catechism finishes with the same principle that Bellarmine taught concerning how we are to interpret Scripture within the context of the same Spirit that gave it:

> But since Sacred Scripture is inspired, there is another and no less important principle of correct interpretation, without which Scripture would remain a dead letter. Sacred Scripture must be read and interpreted in the light of the same Spirit by whom it was written.[519]
>
> Read the Scripture within the living Tradition of the whole Church.[520]
>
> Lastly, the Catechism gives primacy to the literal interpretation:
>
> The literal sense is the meaning conveyed by the words of Scripture and discovered by exegesis, following the rules of sound interpretation: All other senses of Sacred Scripture are based on the literal.[521]

Brown and his like-minded colleagues arbitrarily assign passages to the realm of fiction merely because they regard them as too fanciful for modern tastes, such as the story of Jonah and the whale, the flood of Noah's day, or any number of narratives that exhibit a certain amount of miraculous intrusion. Of course, included in Brown's wish for the "intent" of the biblical author to speak in non-literal ways are those passages that speak about the sun revolving around the Earth and the Earth being motionless in space.

[519] *Ibid.*, ¶ 111.

[520] *Ibid.*, ¶ 113.

[521] *Ibid.*, ¶ 116.

> **Galileo**: Accordingly it would be necessary to attribute to God feet and hands and eyes and even human and bodily feelings like anger, regret, hatred, and even occasional forgetfulness of the past and ignorance of the future. Many propositions are found in the Scriptures which, in respect to the bare meaning of the words, give an impression which is different from the truth, but they are stated in this way in order to be accommodated to the incapacities of the common man. As a result, for those few who deserve to be distinguished from the common people, it is necessary that wise expositors provide the true meanings and indicate the particular reasons why the Scriptures are expressed in such words.

Analysis: Objectors to the Church's literal interpretations of biblical cosmology often attempt to dismiss her claims by appealing to the many anthropomorphisms in Scripture that describe God's being and actions (*e.g.*, Gn 6:8: "eyes of the Lord"; Ex 6:6: "the arm of the Lord"; Dt 9:10 "finger of God"). As the argument goes, if we cannot interpret these kinds of passages literally, we have no obligation to interpret biblical cosmology literally. But the argument is fallacious. Early in her history the Church decreed that God does not have human body parts and thus there was no debate on how to interpret such passages. Although it can safely be said that God, being omniscient and omnipresent, sees all our actions and hears all our words, he does not gather this information through human-like eyes or ears, otherwise he would be human. Likewise, even though there are many passages of Scripture in which men hear God speaking to them in their own language (*e.g.*, Mk 1:11: "Thou are my beloved Son; in Thee I am well pleased"), still, the sound waves that hit the human eardrum are not made by a human-like mouth. God makes the sounds in his own mysterious way. Therefore, because Church doctrine has already established that God does not have human body parts, the exegete is required to interpret such passages anthropomorphically.

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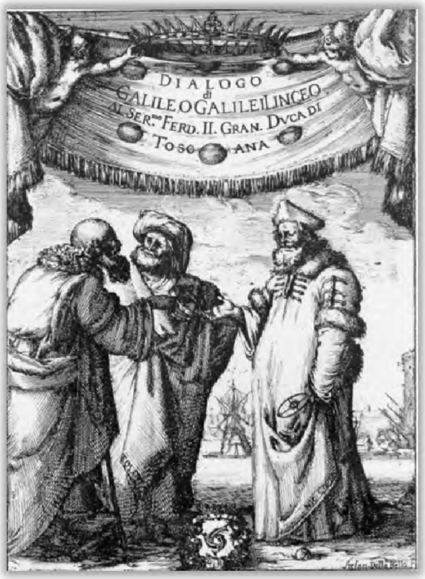
Covers of Galileo Books and Letters


DIALOGO
di
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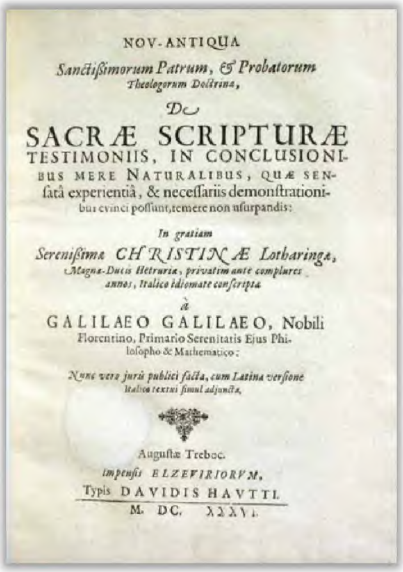
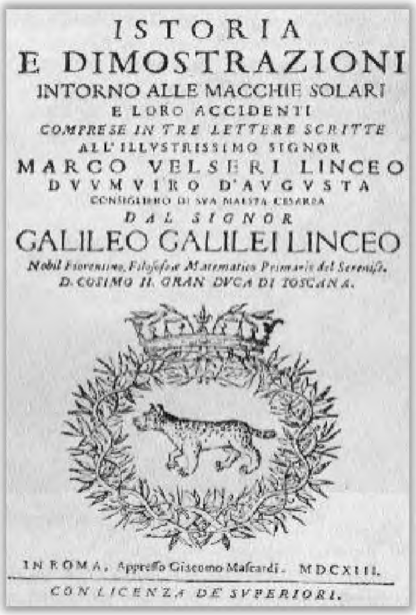
Dialogue on the Two Great World Systems



NOV-ANTIQUA
Sanctiſſimorum Patrum, & Probatorum
Theologorum Doctrina,
De
SACRÆ SCRIPTURÆ
TESTIMONIIS, IN CONCLUSIONIBUS
MERE NATURALIBUS, QUÆ SENſatâ
experientiâ, & neceſſariis demonſtrationibus
evinci poſſunt, temere non uſurpandis:
In gratiam
Sereniſſimæ CHRISTINÆ Lotharingæ,
Magnæ-Ducis Hetruriæ, privatim ante complures
annos, Italico idiomate conſcripta
à
GALILAEO GALILAEO, Nobili
Florentino, Primario Serenitatis Ejus Philoſopho
& Mathematico:
Nunc vero juris publici facta, cum Latina verſione
Italico textui ſimul adjuncta,

Auguſtæ Treboc.
Impenſis ELZEVIRIORVM,
Typis DAVIDIS HAVTTI.
M. DC. XXXVI.

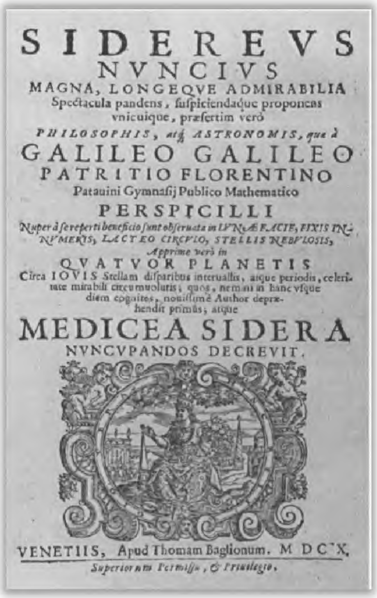
Letter to Duchess Christina



ISTORIA
E DIMOSTRAZIONI
INTORNO ALLE MACCHIE SOLARI
E LORO ACCIDENTI
COMPRESE IN TRE LETTERE SCRITTE
ALL'ILLVSTRISSIMO SIGNOR
MARCO VELSERI LINCEO
DVVMVIRO D'AVGVSTA
CONSIGLIERO DI SVA MAESTA CESAREA
DAL SIGNOR
GALILEO GALILEI LINCEO
Nobil Fiorentino, Filoſofo e Matematico Primario del Sereniſs.
D. COSIMO II. GRAN DVCA DI TOSCANA.

IN ROMA, Appreſſo Giacomo Maſcardi. MDCXIII.
CON LICENZA DE SVPERIORI.

Book Concerning Sunspots



SIDEREVS
NVNCIVS
MAGNA, LONGEQVE ADMIRABILIA
Spectacula pandens, ſuſpiciendaque proponens
vnicuique, præſertim verò
PHILOSOPHIS, atq; ASTRONOMIS, quæ à
GALILEO GALILEO
PATRITIO FLORENTINO
Patauini Gymnaſij Publico Mathematico
PERSPICILLI
Nuper à ſe reperti beneficio ſunt obſeruata in LVNÆ FACIE, FIXIS INNVMERIS, LACTEO CIRCVLO, STELLIS NEBVLOSIS,
Apprime verò in
QVATVOR PLANETIS
Circa IOVIS Stellam diſparibus interuallis, atque periodis, celeritate mirabili circumuolutis; quos, nemini in hanc vſque diem cognitos, nouiſſimè Author deprehendit primus; atque
MEDICEA SIDERA
NVNCVPANDOS DECREVIT.

VENETIIS, Apud Thomam Baglionum. M DC X.
Superiorum Permiſſu, & Priuilegio.

The Book *Siderius Nuncius*

At the other extreme, however, are instances when the Church insists on a literal interpretation, even when the resulting conclusion cannot be explained by science or does not agree with science. Such is the case with Transubstantiation. The Church insists that certain passages, such as Mt 26:26 ("This is my body") must be interpreted literally, though science insists such phenomena is impossible under ordinary physical laws.

The point to be gleaned from these two opposite poles of biblical exegesis is that interpretation is always subject to the principle known as 'the hierarchy of truths,' that is, a higher or confirmed truth sets the limits on how one can interpret other passages of Scripture that are more vague or ambiguous. As noted above, the higher truths concerning the nature of God prohibit the exegete from interpreting certain passages as teaching that God has human body parts. Similarly, the higher truths given by the Holy Spirit to the Church prohibit the same exegete from interpreting in a non-literal manner passages concerning the eating of Christ's flesh.[522]

As it stands, Cardinal Bellarmine explained to Foscarini and Galileo that the Church had long ago determined that Scripture's data concerning the fixity of the Earth and the movement of the sun had to be interpreted literally. From Solomon, to the Church Fathers, to the medieval theologians, and now the magisterium of the Church itself, all agreed that, of the two possible interpretations (literal or figurative), the Scripture must be interpreted literally in these particular cases. According to Bellarmine, there was no scientific proof to the contrary, and there never would be. He was right, since no modern scientist worth his reputation can claim that heliocentrism has been proven.

Interestingly enough, Galileo's appeal to Scripture's anthropomorphisms as the rationale to interpret Scripture's cosmological passages in a non-literal manner is very similar to modern science's attempt to eliminate the Church from today's discussion concerning whether evolution is a valid theory of science. Based on the claim that the Church was wrong about physics and astronomy in the case of Galileo, it has also concluded that because of similar ignorance about geology and paleontology, the Church is wrong about Darwin. This ploy has been used countless times in classrooms, books and general discussion. The Church is ridiculed and summarily dismissed as an authority on the subject of science and other modern issues (abortion, stem cell research, sexual relations, *etc.*) since, as the argument goes, 'it should have learned its lesson' about the supremacy of science when it erroneously chastised Galileo. Annibale Fantoli claims, for example, that

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[522] *Cf.* Jn 14:16-17; 15:26; 16:13. Even Protestant denominations who do not interpret Mt 26:26 in a literal manner are, in a reverse manner, following the "hierarchy of truths" principle, since they have determined, *a priori*, that such passages cannot be interpreted literally.

> …it seems to me erroneous, even from a religious point of view, to claim that by now the "Galileo Affair" is a thing of the past, a question closed forever. It remains, and should remain, "open," on the contrary, as a severe lesson of humility to the Church at all levels and as a warning, no less rigorous, not to wish to repeat in the present or in the future the errors of the past, even the most recent past.[523]

Such sentiments are filled with theological and scientific presumption. As we have presented in meticulous detail, the Church was not wrong, Galileo was wrong, for he had no proof of heliocentrism and there never has been proof. The only lesson to be learned is this: as the Church put its faith in Scripture, the Fathers, and the guidance of the Holy Spirit for the fifteen hundred years prior to Galileo, it must do the same for the five hundred years after Galileo and beyond. Tradition and faithfulness are the Church's trademark; reinvention and revolution are the world's curse. In reality, whereas the world sought an apology from the Church for its censorship of Galileo, it is now the world that owes an apology to the Church for doubting its God-given authority to decide such matters for the good of the whole world.

> **Galileo**: Granting then that in many passages the Scriptures not only can be, but necessarily must be, interpreted differently from the apparent meaning of the words, it seems to me that in cases of natural disputes Scripture ought to be put off to the last place…. Moreover it is agreed that, to accommodate itself to the understanding of everyone, Scripture says many things which are different from absolute truth in the impression it gives and in the meaning of its words. On the other hand nature is inexorable and immutable and cares not whether its hidden causes and modes of operation are or are not open to the capacities of humans, and hence it never violates the terms of its established laws. As a result it seems that natural effects, which either sense experience places before our eyes or necessary demonstrations reveal, should never be placed in doubt by passages of Scripture whose words give a different impression; and further not everything said in the Scriptures ought to be associated strictly with some effect in nature. Because of this characteristic alone, *i.e.*, that

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[523] *Galileo: For Copernicanism and the Church*, p. 511.

> Scripture accommodates itself to the capacity of uncouth and uneducated people, Scripture does not refrain from faintly sketching its most important dogmas, thus attributing to God himself conditions which are very far from, and contrary to, his essence. So who would wish to maintain with certainty that Scripture abandons this characteristic when it speaks incidentally of the earth or the sun or other creatures, and has chosen to restrain itself completely within the limited and narrow meaning of the words? – and especially when it speaks about those created things which are very far from the primary purpose of the Scriptures? – or even when it speaks of things which, when stated and presented as bare and unadorned truths, would quickly damage its primary intention by making the common man more stubbornly resistant to be persuaded of the articles concerning his salvation?

Analysis: We often hear the same arguments today concerning the so-called "uneducated peoples" of biblical times. The academic elite of our day have conditioned us to think of early man as a grunting and insipid hunter-gatherer who could only understand the simplest of concepts. This is far from the truth. In the early chapters of Genesis the biblical picture of early man is someone with vast intellectual capacity and the physical prowess to match it (Genesis 1-11).

In regard to understanding the mechanics of the heavens, even the so-called "educated" people of our modern day use the same phenomenal language as did early man when speaking about celestial phenomena. After thousands of years of language development and scientific advances we still say "the sun rises" and "the sun sets," just as ancient man did. Technically speaking, this choice of words is scientifically inaccurate. That being the case, should we then look upon ourselves as uneducated? Obviously not, since our very education teaches us that there is a vast difference between speaking figuratively and knowing the literal truth. The fact is, the sun neither literally rises nor literally sets in the heliocentric or geocentric systems. In the former the sun is the centerpiece and in the latter it is revolving around the Earth. Although the sun is moving in the geocentric system, it is not literally "rising" or "setting"; rather, such terms merely describe the contrasting movement of the sun as measured against the backdrop of the Earth's horizon. As the saying goes, one does not have to be a rocket scientist to know the difference between describing the end of the day as "the sun is setting" over against the fact that, of the two bodies (the Earth or the sun), one must be considered the centerpiece and the other the orbiting body. Those facts can easily be discerned by the human intellect whether the person is from 4000 B.C. or 2000 A.D.

As the people in ancient cultures spoke about the cosmos the same as we do today, similarly, as they once did, we still employ anthropomorphic language when we describe the attributes of God. We continue to refer to God's "eyes" watching us and God's "ears" hearing our words just as the so-called "uneducated" peoples of former years. All in all, it is a pure myth that peoples of former times were not able to distinguish phenomenal language from actual events.

By the same token, if God had put in Holy Writ the precise scientific explanation of each and every natural phenomenon, it is likely that few if any scientists today would be able to understand it. As we have painstakingly discovered in earlier chapters of our book, modern science has failed time after time to come to an adequate understanding of how the universe operates. Its two major theories of how the universe is constructed on macro- and micro-scales, namely, General Relativity and Quantum Mechanics, flatly contradict each other. As the history of science has shown, for every theory that is advanced as truth, another one is right behind waiting to dethrone it. As Max Planck once said: "Science proceeds funeral by funeral."

In light of the foregoing, one of the most important but overlooked dimensions of the problem between science and faith is the vast difference that exists between gathering scientific data and the correct interpretation of that data. Scientific data is plentiful and wide-ranging. We have thousands of modern instruments that gather millions of bits of data every day. But correctly interpreting the data into a unified and cohesive whole is much more difficult to accomplish and few have the gift to do so. The history of science is not only riddled with misinterpretations of scientific data but it remains the case that dozens of viable interpretations can be produced from a single scientific datum. We, for example, assign the word "gravity" to the simple phenomenon of an apple dislodging from a tree and suddenly falling to the ground. If we believe what our eyes show us, it is a scientific fact that apples fall toward the Earth. But there are about a half-dozen theories, and still counting, as to the nature of the force that brings the apple toward the Earth. Modern man does not know if it is a push, a pull, or both or neither. Simply put, for all his supposed scientific prowess, modern man has not been able to explain, to anyone's complete satisfaction, why an apple falls to the ground. Should we consider ourselves "uneducated" because we cannot answer that simple question? Perhaps a little humility would not hurt in this case. Perhaps then we would not be so sure of ourselves against Holy Writ's testimony of what is fixed and what is revolving. In any case, the point remains that science is not some monolithic consensus of belief and practice that produces right answers upon request. Science is prone to errors, especially in its interpretation of data. As one of the more respected and famous physicists, Richard Feynman, admitted: "Science is a culture of doubt."

Lastly, it is fallacious to argue that we force Scripture to stray "very far from its primary purpose" when we extract scientific facts from it. As we noted earlier, the *Declaration of Independence* and the *United States Constitution* are primarily political documents, but when they touch upon an area of religion (*e.g.*, God's existence and the fact that he created all men equal), these documents are vested with just as much authority as they have in their non-religious statements. Additionally, in regard to what is true, it is also erroneous to create a dichotomy in Scripture between a primary purpose and a secondary purpose. Merely because a certain fact is considered primary (*e.g.*, salvation, resurrection, eternity) does not mean that it is any truer than a secondary fact (*e.g.*, Jacob had twelve sons). If it were the case that a secondary fact were proven untrue, it would directly effect the veracity of primary facts, since logical reasoning would dictate that if the authoritative source could be wrong on a secondary fact why could it not be wrong on a primary fact? Obviously, an imperfect mind produced the one error so there is nothing to stop it from producing another. If anything, the veracity of the secondary facts upholds the veracity of the primary facts, and *vice-versa*. The Scriptural axiom understands this relationship very well, for as Jesus said: "He who is faithful in a very little is faithful also in much; and he who is dishonest in a very little is dishonest also in much."[524]

> **Galileo**: Granting this, and also granting that it is even more obvious that two truths can never be contrary to each other, it is the task of wise expositors to try to find the true meanings of sacred passages in accordance with natural conclusions which previously have been rendered certain and secure by manifest sensation or by necessary demonstrations. Furthermore, as I have said, although Scripture has been dictated by the Holy Spirit, for the reasons mentioned above it is open in many passages to interpretations far removed from the literal meaning; and moreover we cannot determine with certitude that all the interpreters speak with divine inspiration. As a result I believe that it would be prudent to agree that no one should fix the meaning of passages of Scripture and oblige us to maintain as true any natural conclusions which later sensation or necessary and demonstrative proofs might show to be contrary to truth. Who would we wish to place limits on human understanding? Who would wish to assert that everything which is knowable

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[524] Luke 16:10.

> about the world is already known? And therefore, except for the articles concerning salvation and the foundations of the faith, against the strength of which there is no danger that any valid and forceful doctrine could ever arise, it would be perhaps the best advice not to add anything without necessity. Granting this, what greater confusion could arise than from the increase of questions from people who, besides our not knowing whether they speak with inspiration by heavenly power, we do know are totally barren of the intelligence needed not only to challenge but even to understand the demonstrations used by the most exact sciences to confirm their conclusions?

Analysis: Similar to many people who argue for the heliocentric position today, Galileo argued that either the proof had already been demonstrated, or, if it had not been demonstrated, it will someday be the case. For example, today when a person enters a scientific museum and observes the Foucault pendulum circling around every twenty-four hours, he is convinced this is an indisputable demonstration of the Earth's rotation beneath him. So convinced is he that he will argue the case just as vehemently as he will argue his own existence. It is not really his fault, however, since he has been unduly conditioned by the modern scientific establishment to think that the only solution to the turning pendulum is a rotating Earth. The vast majority of people do not even know that an equally viable alternative exists (*i.e.*, the rotation of the stars around a fixed Earth), much less would they be able to know how to argue for its validity against the scientific *status quo*. Galileo was of a similar mindset. Simply because of a few pieces of circumstantial evidence that suggested the Earth might be rotating and revolving,[525] coupled with the slight but inherent problems with the Ptolemaic model, Galileo was convinced that Copernicanism was a reality. He then expanded on this logic by arguing from Benito Pereyra's famous 16th century commentary on Genesis regarding four rules on biblical interpretation, the last being:

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[525] As Galileo put in the mouth of Sagredo in his *Dialogo*: "In the conversations of these four days we have, then strong evidences in favor of the Copernican system, among which three have been shown to be very convincing – those taken from the stoppings and retrograde motion of the planets, and their approaches toward and recessions from the Earth; second, from the revolution of the Sun upon itself, and from what is to be observed in the sunspots; and third, from the ebbing and flowing of the ocean tides" (*Galileo's Daughter*, p. 177).

> Since every truth agrees with every other truth, the truth of Sacred Scripture cannot be contrary to the true arguments and evidence of the human sciences.

Galileo quotes Pereyra's rule in his 1615 *Letter to the Grand Duchess Christina*.[526] The problem, of course, is that geocentrism does not contradict the "human sciences," for the latter are so varied and uncertain about cosmological issues that no one should dare refer to them as a monolithic source of knowledge. The real truth, as we have clearly demonstrated in this book, is that no scientific proof for heliocentrism exists. Ironically, if modern science after Galileo has shown us anything worth knowing it is that it cannot disprove biblical cosmology.

Here, interestingly enough, is where we pause to note the same rationale in Galileo's thinking that he adopted near his death in 1641 when he told Francesco Rinuccini that he rejected Copernicanism. In the *Letter to the Grand Duchess Christina* (which is a letter Galileo wrote as an expanded version of his *Letter to Castelli*), Galileo admits the following:

> I should judge that the authority of the Bible was designed to persuade men of those articles and propositions which, surpassing all human reasoning, could not be made credible by science, or by any other means than through the very mouth of the Holy Spirit. Yet even in those propositions which are not matters of faith, this authority [Scripture] ought to be preferred over that of all human writings which are supported only by bare assertions or probable arguments, and not set forth in a demonstrative way. This I hold to be necessary and proper to the same extent that divine wisdom surpasses all human judgment and conjecture.[527]
>
> From the above words [of Augustine in *The Literal Interpretation of Genesis*, 1, 21] I conceive that I may deduce this doctrine: That in the books of the sages of this world there are contained some physical truths which are soundly demonstrated, and others that are merely stated; as to the former, it is the office of wise divines to show that they do not contradict the Holy Scriptures. And as to the propositions which are stated but not rigorously demonstrated, anything contrary to the Bible

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[526] As noted by Richard Blackwell in *Galileo, Bellarmine and the Bible*, p. 22, fn. 26.

[527] As translated by Stillman Drake in *Discoveries and Opinions of Galileo*, 1957, p. 183.

> involved in them must be held undoubtedly false and should be proved so by every possible means.[528]
>
> Among physical propositions there are some with regard to which all human science and reason cannot supply more than a plausible opinion and probable conjecture in place of a sure and demonstrated knowledge; for example, whether the stars are animate. Then there are other propositions of which we have (or may confidently expect) positive assurances through experiments, long observation, and rigorous demonstration; for example, whether or not the earth and the heavens move, and whether or not the heavens are spherical. As to the first sort of propositions, I have no doubt that where human reason cannot reach – and where consequently we can have no science but only opinion and faith – it is necessary in piety to comply absolutely with the strict sense of the Scripture. But as to the other kind, I should think, as said before, that first we are to make certain of the fact, which will reveal to us the true senses of the Bible, and these will most certainly be found to agree with the proved fact (even though at first the words sounded otherwise), for two truths can never contradict each other. I take this to be an orthodox and indisputable doctrine, and I find it specifically in St. Augustine…[529]

Of course, Galileo appears to be what James describes as "a double-minded man,"[530] for in one breath he extols the authority of Scripture over the unproven claims of science; in the other he leaves himself one scientific exception that he claims Scripture did not address in a definitive way for him to cease from imposing heliocentrism upon it. The real irony is that Galileo employs Ecclesiastes 3:11 to help prove his point, but reverses the traditional meaning of the passage so that he can use it to support his favorite cosmological model. Thus he adds in the midst of the foregoing passages:

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[528] *Ibid*., p. 194. Annibale Fantoli shows here, however, that Galileo misconstrued the words of Augustine, having read them from Pereyra's commentary on Genesis. Migne's Patrologia Latina has *qui calumniari Libris nostrae salutis affectant* ("those who pretend to calumniate the Books of our salvation") instead of Pereyra's *sapientes huius mundi* ("the wise ones of the world"). In other words, some make it appear as if certain propositions of science do not contradict Scripture when, in fact, they do. See *Galileo: For Copernicanism and for the Church*, pp. 195-198.

[529] *Ibid*., p. 197.

[530] James 1:7-8: "For that person must not suppose that a double-minded man, unstable in all his ways, will receive anything from the Lord."

> We have it from the very mouth of the Holy Ghost that God delivered up the world to disputations, 'so that man cannot find out the work that God hath done from the beginning ever to the end.' In my opinion no one, in contradiction to that dictum, should close the road to free philosophizing about mundane and physical things, as if everything had already been discovered and revealed with certainty…. One of these is the stability of the sun and mobility of the earth, a doctrine believed by Pythagoras and all his followers…amplified and confirmed with many observations and demonstrations by Nicholas Copernicus.[531]

Galileo's second argument in the *Letter to Castelli* (*i.e.*, that not all the speakers in the Bible spoke from divine inspiration) is also erroneous. The mere admission that not all spoke under divine inspiration means that some, indeed, *did* speak with divine inspiration. The only question is: who spoke under inspiration and who did not? Moses certainly spoke with divine inspiration when he wrote the first chapters of Genesis since he was not born until thousands of years after the creation. The only way he could have known how God created the cosmos is through the revelation provided by divine inspiration.[532] Moses' cosmology, if interpreted at face value, is geocentric, and thus Galileo's argument has been answered since no inspired biblical author following Moses contradicted what Moses wrote under divine inspiration. The same divine inspiration was working in all the remaining biblical writers who taught that the universe is geocentric. In reality, Galileo has little basis from which to form his objection since in the latter part of his letter to Castelli he already committed himself to viewing Joshua's account of the stoppage of the sun as a divinely inspired work, for otherwise he would have no reason to attempt to explain the account from a heliocentric perspective.[533] Accordingly, the Psalms, from which most of the geocentric witness originates, have always been accepted for their foundation in divine inspiration. In fact, the Psalms are quoted in the New Testament as a divinely authoritative source more than any other Old Testament book. Hence, if there is any book in the Old Testament that considers the speaker as one who was under direct divine dictation it is the Psalms, King David being the primary writer. The same divine inspiration was also given to Solomon, the author of the geocentric passages in Ecclesiastes and Proverbs. The same is true of Isaiah and his treatment of Hezekiah's sundial; and Habakkuk in his citing of Joshua's long day. The only time a question rises as to whether the speaker is under divine inspiration is in Job 22:13-14 when Eliphaz is speaking to Job, for later in the book, God chastises Eliphaz for not speaking truthfully (Jb 42:7). But even in that case, God is not faulting Eliphaz for his cosmological knowledge but only his misapplication of the evidence to the innocent Job. Even if there was some doubt as to whether one of the speakers was under divine inspiration, nevertheless, there are an abundance of passages in other parts of Scripture that we know positively the speaker was under divine inspiration. As it stands, Galileo did not have a case. His objection actually strengthens the geocentric case, for if he cannot prove that the writer is not inspired, he is bound to whatever that writer dictates as truth.

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[531] Stillman Drake, *Discoveries and Opinions of Galileo*, pp. 187-188

[532] NB: Unlike modern exegetes who believe that the Jews coming back from the Babylonian captivity wrote Genesis 1, Galileo believed that Moses wrote Genesis.

[533] See Galileo's explanation of Joshua 10:10-14 in Chapter 12 of this book.

> **Galileo**: I believe that the authority of Sacred Scripture has the sole aim of persuading men of those articles and propositions which, being necessary for salvation but being beyond all human discourse, cannot come to be believed by any science or by any means other than by the mouth of the Holy Spirit himself. I do not think that it is necessary to have belief in cases in which God himself, who is the source of meaning, of discourse, and of intellect, has put the use of revelation to one side and has decided to give us in another way the knowledge which we can obtain through science. This is especially true of those sciences of which only a very small part, and then as projected in conclusions, is to be found in the Scriptures. Such is precisely the case with astronomy, of which there is such a small part in the Scriptures that the planets are not even mentioned. However if the sacred writers had intended to teach us about the arrangements and movements of the celestial bodies, they would not have said so little, almost nothing, in comparison with the infinite, highest, and admirable conclusions contained in this science…[534]

Analysis: Galileo's argument is once again off the mark. His contention is that since Scripture does not cover the area of cosmology as vastly as it does other subjects of import, we can conclude that it did not intend its statements about cosmology to be taken too seriously or with the same authority as non-cosmological passages. This is another instance in which Galileo creates his own criteria so that he can then use it to dismiss ideas he does not like. The extent of Scripture's treatment of cosmology, or lack thereof, has nothing to do with the veracity of its statements on cosmology. Galileo's argument would be akin to saying that since the 26 volumes of the *Encyclopedia Britannica* treat the subject of spiders in just one volume, and in only certain pages of that volume, this puts in doubt the authority with which the Britannica speaks on the issue. The truth is, the Britannica will speak as authoritatively on spiders as it does on any other subject, even though it may only treat spiders in less than .01% of its words.

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[534] As translated by Richard J. Blackwell in *Galileo, Bellarmine and the Bible*, pp. 195-198. Galileo's concluding paragraph of the first section is left out because of its redundancy. The original Italian version appears in Favaro's *Galileo E L'Inquisizione*, pp. 39-41.

Galileo's argument is also erroneous based on the simple fact of how the Bible begins its address to man in its very first book. The opening words of the first chapter of Genesis do not begin with a description of God or man, but with a detailed account of the structure of the cosmos. Obviously, communicating the underpinnings of the celestial world was the most important piece of revelatory information God initially needed to tell mankind. Not coincidentally, the very first fact we are told about the cosmos is that the Earth was created first, before the sun and stars, thus implying a geocentric universe. If, as Galileo claims, (a) God did not consider the treatment of cosmology as a very important matter to address, and (b) that its resultant scarcity in Scripture meant we were not required to take the issue very seriously, why did God make it the foundation of Holy Writ's opening chapters?

The Investigation of Galileo Continues

As we have noted in the aforementioned arguments, the interpretation of Scripture is key to grasping the implications of the Galileo affair. After Galileo's publication of *Sidereus nuncius* ("Starry Messenger") in 1610 with its forthright advocacy of heliocentrism and consequent dependence on a non-literal interpretation of Scripture, objections to his methodology were soon to be voiced. Two Dominican friars from Florence, Niccolò Lorini and Tommaso Caccini, took the first shots as investigators for the Inquisition. The archives reveal that their investigation began in February 1615.[535] A year later, on February 19, 1616, Caccini submitted two statements to the Holy Office that summed up his objections to the Copernican model:

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[535] "Nel mese di Febraro 1615 il Padre Maestro Fra Nicolò Lorini, Domenicano di Fiorenza, trasmisse qua una scrittura del Galileo, che in quella città correva per manus, la quale seguendo le positioni del Copernico, che la terra si muova sando che tale scrittura fu fratta per occasione di contradire a certe lettioni fatte nell chiesa di S.^{ta} Maria Novell dal P. Maestro Caccini sopra il X capitolo di Giosue,

1) The sun is at the center of the world and hence immobile in regards to local motion.

2) The Earth is not the center of the world and is not immobile, but moves according to the whole of itself, and also with diurnal motion.

Five days later, February 24, the Holy Office issued these censures:

Regarding the first proposition:

> All agreed that this proposition is foolish and absurd in philosophy and is formally heretical, because it explicitly contradicts sentences found in many places in Sacred Scripture according to the proper [literal] meaning of the words and according to the common interpretation and understanding of the Holy Fathers and of learned theologians.

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alle parole Sol, me movearis: fol. 2. La scrittura è in forma di lettera, scritta al P. D. Benedetto Castelli Monaco Cassinense, Matematico all'hora di Pisa, e contiene le infrascritte propositioni: Che nella Scrittura Sacra di trovano molte propositioni false quanto al nudo senso delle parole; Che nelle dispute naturali ella doverebbe esser riserbata nell' ultimo luogo; Che la Scrittura, per accommodarsi all' incapacità del populo, non si è astenuta di pervertire de' suoi principalissimi dogmi, attribuendo sin all' istesso Dio conditioni lontanissime e contrarie alla sua essen[tia]. Vuole che in certo modo prevaglia nelle cose naturali l' argomento filosofico al sacro. Che il commando fatto da Giosue al sole, che si fermasse, di deve intend[ere] fatto non al sole, ma al primo mobile, quando non si tenga il sistema Copernico. Per diligenze fatte non si potè haver l'originale di questa lettera: f. 25. Fu esaminato il Padre Caccini, qual depose, oltre le cose sodette, d'haver sentito dire alter opinioni erronee dal Galileo: fol. 11: Che Dio sia accidente; che realmente rida, pianga, etc.; che li miracoli quali dicesi essersi fatti da' Santi, non sono veri miracoli. Nominò alcuni testimony, dall' esame de' quali si deduce che dette propositioni non fussero assertive del Galileo nè de' discepoli, ma solo disputative. Veduto poi nel libro delle macchie solari, stampato in Roma dal medesimo Galileo, le due propoitioni: Sol est centrum mundi, et omnino immobilis motu locali; Terra non est centrum mundi, et secundum se totam movetur etiam motu diurno: fol. 34, furno qualificate per assured I filosofia: fol 35; e la prima, per heretica formalmente, come espressamente ripugnante alla Scrittura et opinione de'Santi; la 2^{a}, almeno per erronea in Fide, attesa la vera teologia" (Antonio Favaro, *Galileo E L'Inquisizione*, pp. 33-34).

Regarding the second proposition

> All agreed that this proposition receives the same censure in philosophy and in respect to theological truth, it is at least erroneous in faith.[536]

The Trial of Galileo

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[536] Favaro records the original as follows: "Propositiones censurandae. Censura facta in S.to Officio Urbis, dei Mercurii 24 Februarii 1616, coram infrascriptis Patribus Theologis. Prima: Sol est centrum mundi, et omnino immobilis motu locali. Censura: Omnes dixerunt, dictum propositionem esse stultam et absurdam in philosophia, et formaliter haereticam, quatenus contradicit expresse sententiis Sacrae Scripturae in multis locis secundum proprietatem verborum et secundum communem expositionem et sensum Sanctorum Patrum et theologorum doctorum. 2.a: Terra non est centrum munid nec immobilis, sed secundum se totam movetur, etiam motu diurno. Censura: Omnes dixerunt, hanc propositionem recipere eandem censuram in philosophia; et spectando veritatem theologicam, ad minus esse in Fide erroneam." The names signed to the document are the eleven members of the papal commission.

On February 25, 1616, **Pope Paul V** ordered Cardinal Bellarmine to summon Galileo and, "in the presence of a notary and witnesses lest he should prove recusant, warn him to abandon the condemned opinion and in every way abstain from teaching, defending or discussing it."[537] What is not commonly known is that the meeting of February 25 had three parts, and this sequence shows how great a part the pope played in the final decision against Galileo:

> As was customary, the meeting had three successive parts. During the first one, the assessor, accompanied by the commissary, informed the pope and the cardinals about the censures approved by the consultors and other questions to be dealt with in connection with the Copernican issue. After that, both of them left the hall and the secret second part of the meeting started, in the presence of the pope and the cardinals alone. This explains why the only official document that is left about the meeting, published by Favaro, concerns solely the third part of it, which took place again in the presence of the assessor and the commissary. The necessity of informing those officials of the Holy Office about the decisions taken by the pope during the secret part of the session – as stated in the document – becomes fully understandable.[538]

The official document from the third part of the meeting stated the following:

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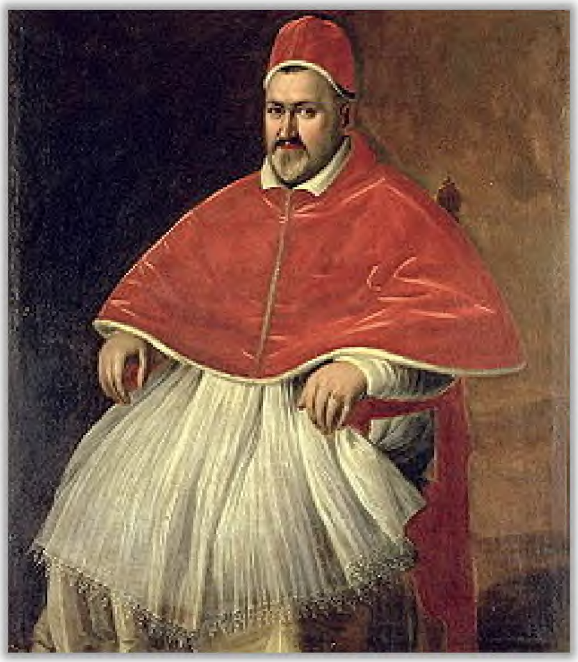
[537] Dorothy Stimson, *The Gradual Acceptance of the Copernican Theory of the Universe*, 1917, p. 58. Favaro has the following: "…supradictus P. Commissarius praedicto Galileo adhuc *ibid*em praesenti et constituto praecepit et ordinavit [proprio nominee] S. D. N Papae et totius Congregationis S. Officii, ut supradictam opinionem, quod sol sit centrum mundi et immbolilis et terra moveatur, omnino relinquat, nec eam de caetero, quovis modo, teneat, doceat aut defendat, verbo aut scriptis; alias, contra ipsum procedetur in S. Officio. Cui praecepto idem Galileus aquievit et parere promisit" (Antonio Favaro*, Galileo e l'Inquisizione,* 1907, p. 62).

[538] "The Disputed Injunction and Its Role in Galileo's Trial," by Annibale Fantoli, in *The Church and Galileo*, p. 118. Fantoli adds: "The division in three parts of the meeting of *feria V* (Thursday), in the presence of the pope, is documented by several records on the functioning of the Holy Office in the first part of the seventeenth century…The absence of any mention of these three stages of the meeting…published by Favaro is due to the fact that these documents, as was customary, mention only the decisions taken, without any information about the way the meetings were held or about the discussions that took place during them" (*ibid*., p. 144).

> The Most Illustrious Cardinal Millini notified the Reverent Lord Assessor and Lord Commissary of the Holy Office that, after the reporting of the judgment by the Father Theologians against the propositions of the mathematician Galileo, to the effect that the sun stands still at the center of the world and the earth moves even with a diurnal motion, His Holiness ordered the Most Illustrious Cardinal Bellarmine to call Galileo before himself and warn him to abandon these opinions; and if he should refuse to obey, the Father Commissary, in the presence of notary and witnesses, is to issue him an injunction to abstain completely from teaching or defending that doctrine and opinion or from discussing it; and further, if he should not acquiesce, he is to be imprisoned.[539]



Pope Paul V

Galileo obeyed the order, which is recorded in the minutes of the Holy Office of March 3, 1616:

> The Most Illustrious Lord Cardinal Bellarmine having given the report that the mathematician Galileo Galilei had acquiesced

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[539] *Le Opere di Galileo Galilei*, vol. 19, p. 321, translated by Fantoli.

> when warned of the order of the Holy Congregation to abandon the opinion which he held till then, to the effect that the sun stands still at the center of the spheres but the earth is in motion.[540]

This was followed by a formal decree issued on March 5, 1616. According to the wording of the decree, Paul V's and Bellarmine's rejection of Copernicanism was not considered some private affair between them and Galileo. The decree stated very clearly that its information was to be "published everywhere" and that its specific audience was the "whole of Christendom":

> Decree of the Sacred Congregation of the most Illustrious Cardinals of the Holy Roman Church specially delegated by Our Most Holy Lord Pope Paul V and the Holy Apostolic See to publish everywhere throughout the whole of Christendom.[541]

It contained six explicit paragraphs reiterating the condemnation not only of the book written by "Nicolaus Copernicus" but, more specifically, the original Greek inventors of heliocentrism as represented by "the Pythagorean doctrine – which is false and altogether opposed to Holy Scripture – of the motion of the Earth and the immobility of the Sun." The Church was going right to the root of the problem, – the false ideas propagated by the Greeks. Beginning at line 31, the decrees states:

> And whereas it has also come to the knowledge of the said Congregation that the Pythagorean doctrine – which is false and altogether opposed to Holy Scripture – of the motion of the Earth and the immobility of the Sun, which is also taught by Nicolaus Copernicus in *De revolutionibus orbium coelestium*, and by Diego de Zúñiga [in his book] on Job, is now being spread abroad and accepted by many – as may be seen from a certain letter of a Carmelite Father, entitled *Letter of the Rev. Father Paolo Antonio Foscarini, Carmelite, on the Opinion of the Pythagoreans and of Copernicus concerning the Motion of the*

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[540] *Le Opere di Galileo Galilei*, vol. 19, p. 278, translated by Fantoli.

[541] "Decretum Sacrae Congregationis Illustrissimorum S.R.E.Cardinalium, a S.D.N. Paulo Papa V Sanctaque Sede Apostolica ad Indicem librorum, eorumdemque permissionem, proibitionem, expurgationem et impressionem in universa Republica Christiana, specialieter deputatorum, ubique publicandum" (Antonio Favaro, *Galileo E L'Inquisizione*, p. 63; *Le Opere di Galileo Galilei*, vol. 19, p. 323).

> *Earth, and the Stability of the Sun, and the New Pythagorean System of the World, at Naples, Printed by Lazzaro Scorriggio, 1615*; wherein the said Father attempts to show that the aforesaid doctrine of the immobility of the Sun in the center of the world, and of the Earth's motion, is consonant with truth and is not opposed to Holy Scripture. Therefore, in order that this opinion may not insinuate itself any further to the prejudice of the Catholic truth, the Holy Congregation has decreed that the said Nicolaus Copernicus, *De revolutionibus orbium*, and Diego de Zúñiga, *On Job*, be suspended until they be corrected; but that the book of the Carmelite Father, Paolo Antonio Foscarini, be altogether prohibited and condemned, and that all other works likewise, in which the same is taught, be prohibited, as by this present decree, it prohibits, condemns, and suspends them all respectively.[542]

Perhaps because of rumors that were spreading around Italy that the Holy Office had declared Galileo a heretic, Galileo wrote to Cardinal Bellarmine in May 1616 asking for a clarification of what occurred in the February and March sessions, prompting Bellarmine to write a certificate for Galileo saying that the Holy Office neither forced him to "abjure" his opinions nor was he punished for them:

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[542] Original Latin: "….Et quia etiam ad notitiam praefatae Sacrae Congregationis pervenit, falsam illam doctrinam Pithagoricam, divinaeque Scripturae omnino adversantem, de mobilitate terrae et immobilitate solis, quam Nicolaus Copernicus De revolutionibus orbium coelestium, et Didacus Astunica in Job, etiam docent, iam divulgari et a multis recipe; sicuti videre est ex quadam Epistola impressa cuiusdam Patris Carmelitae, cui titulus: « Lettera del R. Padre Maestro Paolo Antonio Foscarini Carmelitano, sopra l'opinione de'Pittagorici e del Copernico della mobilità della terra e stabilità del sole, et il nuovo Pittagorico sistema del mondo. In Napoli, per Lazzaro Scoriggio, 1615 », in qua dictus Pater ostendere conatur, praefatam doctrinam de immobilitate solis in centro mundi et mobilitate terrae consonam esse veritati et non adversary Sacrae Scripturae; ideo, ne ulterius huiusmodi Opinio in perniciem Catholicae veritatis serpat, censuit, dictos Nicolaum Copernicum De revolutionibus orbium, et Didacum Astunica in Job, suspendendos esse, donec corrigantur; librum vero Patris Pauli Antonii Foscarini Carmelitae omnino prohibendum atque damnandum; aliosque omnes libros, partier idem docentes, prohibendos: prout praesenti Decreto omnes respective prohibit, damnat atque suspendit. In quorum fidem praesens Decretum manu et sigillo Illustrissimi et Reverendissimi D. Cardinalis S. Caeciliae, Episcopi Albanensis, signatum et munitum fuit, die 5 Martii 1616." Part of above translation taken from de Santillana's *The Crime of Galileo*, as cited by Fantoli in *Galileo: For Copernicanism and For the Church*, pp. 223-224.

> We, Robert Cardinal Bellarmine, have heard that Signor Galileo Galilei is being calumniated or alleged to have abjured in our hands and also to have been given salutary penances for this. Having been sought about the truth of the matter, we say that the above-mentioned Galileo has not abjured in our hands, or in the hands of others, here in Rome, or anywhere else that we know, any opinion or doctrine of his; nor has he received any penances, salutary or otherwise. He has only been notified of the declaration made by the Holy Father and published by the Sacred Congregation of the Index, whose content is that the doctrine attributed to Copernicus (that the earth moves around the sun and the sun stands at the center of the world without moving from the east to the west) is contrary to Holy Scripture, and therefore cannot be defended nor held. In witness whereof we have written and signed this with our own hands, on the 26th day of May 1616.[543]

Once again, by the specific statement "the declaration made by the Holy Father" we see the prominent part played by the pope in the whole affair. According to Bellarmine's above official letter, the decision that disallowed anyone from asserting the Earth moved was not one formed by the Sacred Congregation and rubber stamped by the pope, but was first decided by the pope and then published by the Sacred Congregation. That Paul V and Cardinal Bellarmine were of one mind on Galileo and heliocentrism was revealed no better than in a letter written by the Tuscan ambassador in Rome, Piero Guicciardini, to Grand Duke Cosimo II, dated March 4, 1616. According to Finocchiaro's assessement, "Guicciardini appeared to have some inside information about the proceedings [against Galileo], since his position as ambassador gave him direct access to the pope himself as well as to cardinals and other well-connected diplomats.” After verifying Guicciardini’s factual knowledge of the pope’s mind, Finocchiaro concludes: “The letter observes that Pope Paul V and Cardinal Bellarmine agreed that Copernicanism was erroneous and heretical. This was and remains precious information.”[544]

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[543] Original Italian: "Noi Roberto Bellarmino, havendo inteso che il Sig. Galileo Galilei sia calunniato o imputato di havere abiurato in mano nostra, et anco di essere stato per ciò penitenziato di penitenzie salutary, et essendo ricercati della verità, diciamo che il suddetto S. Galileo non ha abiurato in mano nostra nè di altri qua in Roma, nè meno in altro luogo che noi sappiamo, alcuna sua opinione o dottrina, nè manco ha ricevuto penitenzie salutary nè d'altra sorte, ma solo gl' è stata denuntiata la dichiaratione fatta da Nostro Signore et publicata dalla Sacra Congregatione dell' Indice, nella quale si contiene che la dottrina attribuita al Copernico, che la terra si muova intorno al sole et che il sole stia nel centro del mondo senza muoversi da oriente ad occidente, sia contraria alle Sacre Scritture, et però non si possa difendere nè tenere. Et in fede di ciò habbiamo scritta e sottoscritta la presente di nostra propria mano, questo dì 26 di Maggio 1616. Il med. Di sopra Robert Card. Bellarmino" (Antonio Favaro, *Galileo e l'Inquisizione*, pp. 82, 88).

The significance of the pope’s part in the proceedings and the strictness of the admonition given to Galileo are made even more relevant in a second document Bellarmine wrote, a document that was rediscovered sixteen years later under the reign of Pope Urban VIII. This particular document mentions the “Commissary of the Holy Office,” Michelangelo Segizzi, “in the name of his Holiness the Pope,” as giving Galileo a legal “injunction” to refrain from asserting that the Earth moves. It reads:

> Friday, the 26th of the same month [February 1616], at the palace, the usual residence of the said Most Illustrious Lord Cardinal Bellarmine, and in the chambers of His Most Illustrious Lordship, and in the presence of the Reverend Father Michelangelo Segizzi of Lodi, O. P., Commissary of the Holy Office, having summoned the above-mentioned Galileo before himself, the same Most Illustrious Lord Cardinal warned Galileo that the above-mentioned opinion was erroneous and that he should abandon it; and thereafter, indeed immediately, before me and witnesses, the Most Illustrious Lord Cardinal himself being also present still, the aforesaid Father Commissary, in the name of His Holiness the Pope and the whole Congregation of the Holy Office, ordered and enjoined the said Galileo, who was himself still present, to abandon completely the above-mentioned opinion that the sun stands still at the center of the world and the earth moves, and henceforth not to hold, teach, or defend it in any way whatever, either orally or in writing; otherwise the Holy Office would start proceedings against him. The same Galileo acquiesced in the injunction and promised to obey.[545]

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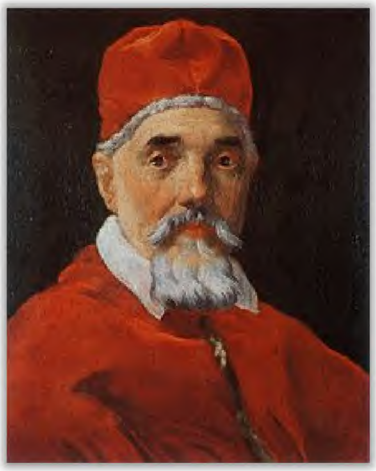
[544] As stated in *Retrying Galileo*, pp. 158-159. The March 4, 1616 letter from Guicciardini to Cosimo II was not published until 1773 by Angelo Fabroni in *Lettere inedited di uomini illustri*, Florence, two volumes, 1773-1775.

[545] *Le Opere di Galileo Galilei*, Antonio Favaro, vol. 19, pp. 321-322, translated by Annibale Fantoli in *The Church and Galileo*, pp. 119-120; the same version in Maurice Finocchiaro’s *The Galileo Affair*, p. 147. An *injunction* is a formal order from a court of law or canonical court ordering a person or group to do or not do something.

Hence, although Bellarmine's initial document stated that Galileo "has not abjured in our hand nor in the hand of any other person in Rome," the second document indicates that there was, indeed, cause for some type of abjuration from Galileo since he both received a legal injunction to cease and desist teaching heliocentrism and "acquiesced" to the injunction. The importance of the second document came to light when the Holy Office of Pope Urban VIII confronted Galileo in 1633 for his persistent teaching of heliocentrism, namely, in his book, *Dialogue on the Two Great World Systems*. To defend his teachings, Galileo gave the pope the first document Bellarmine had written – the one that contained no reference to Galileo receiving an injunction from the Holy Office.

Galileo states to **Pope Urban VIII**:



> In the month of February 1616, Lord Cardinal Bellarmine told me that since Copernicus' opinion, taken absolutely, was contrary to Holy Scripture, it could be neither held nor defended, but it could be taken and used *ex suppositione* (suppositionally). In conformity with this I keep a certificate by Lord Cardinal Bellarmine himself, dated 26 May 1616, in which he says that Copernicus' opinion cannot be held or defended, being against Holy Scripture. I present a copy of this certificate, and here it is.[546]

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[546] *Le Opere di Galileo Galilei*, Antonio Favaro, vol. 19, p. 339, translated by Annibale Fantoli in *The Church and Galileo*, p. 127. Fantoli adds: "The Latin expression *ex suppositione* had a different meaning for Bellarmine than it did for Galileo. For the cardinal it meant that the Copernican theory could be used as a purely mathematical hypothesis for astronomical calculations and thus for 'saving

During the interrogation, Galileo admitted: "there were some Dominican Fathers present" at the meeting of February 26, 1616. Galileo was then asked, "whether at that time, in the presence of those Fathers, he was given any injunction either by them or by someone else concerning the same matter, and if so what?" Galileo gave the following answer:

> As I remember it, the affair took place in the following manner. One morning Lord Cardinal Bellarmine sent for me, and told me a certain detail that I should like to speak to the ear of His Holiness before telling others, but then at the end he told me that Copernicus' opinion could not be held or defended, being contrary to Holy Scripture. I do not recall whether those Dominican friars were there at first or came afterward; nor do I recall whether they were present when Cardinal Bellarmine told me that the same opinion could not be held. Finally, it may be that I was given an injunction not to hold or defend the said opinion, but I do not recall it since this is something of many years ago.[547]

Prompted by the inquisitor to explain further, Galileo seems to have a convenient lapse of memory concerning the injunction. He adds:

> I do not recall that this injunction was given me any other way than orally by Lord Cardinal Bellarmine. I do remember that the injunction was that I could not hold or defend, and maybe even that I could not teach. I do not recall, further, that there was the phrase "in any way whatever," but maybe there was in fact…. Regarding the two phrases in the said injunction now mentioned, namely "not to teach" and "in any way whatever," I do not retain them in my memory, I think because they are not contained in the said certificate, which I relied upon and kept as a reminder.[548]

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the phenomena.' For Galileo, it meant that the Copernican theory could be used as a physical hypothesis, which might later on be shown to represent the real constitution of the world. Galileo relied on the latent ambiguity of this expression to justify the writing of the *Dialogue*" (*ibid*., p. 146).

[547] *Le Opere di Galileo Galilei*, Antonio Favaro, vol. 19, p. 339, translated by Annibale Fantoli in *The Church and Galileo*, p. 128.

[548] *Opere di Galileo Galilei*, Antonio Favaro, vol. 19, p. 340, translated by Annibale Fantoli in *The Church and Galileo*, p. 128. Also in *Galileo E L'Inquisizione*, p. 80, as follows: "Dopo il sodetto precetto io non ho ricercato licenza di scriver il sodetto libro, da me riconosciuto, perchè io non pretendo, per haver scritto detto libro, di haver contrafatto punto al precetto che mi fu fatto, di non tenere nè difender nè insegnare la detta opinione, anzi di confutarla."

According to Bellarmine's second document of February 25, there is no mention that the "injunction" was given orally to Galileo. Perhaps Galileo had a different understanding of what, precisely, an injunction was. Perhaps Galileo did not understand the legal and formal authority an injunction carries, but at least Galileo is coming closer to the reality that an injunction was, indeed, given to him on that date. Galileo then refers to the injunction in more explicit terms when he is questioned regarding how he obtained an imprimatur for his *Dialogo* when, in fact, he had received an injunction seventeen years earlier from Pope Paul V not to hold or teach that the Earth moves. The implication is that Galileo hid the injunction from the censor in order to lessen the difficulty in obtaining an imprimatur. Galileo's explanation is as follows:

> After the above-mentioned injunction, I did not seek permission to write the above-mentioned book…because I did not think that by writing the book I was contradicting at all the injunction given me not to hold, defend or teach the said opinion, but rather that I was refuting it.[549]

The facts regarding the imprimatur are quite opposed to Galileo's rendition. The censor of the *Dialogo* was Fr. Niccolo Riccardi, a man quite favorable to Galileo and his ideas, although he believed the argument about celestial revolutions to be somewhat useless due to his idea that the angels moved the stars and planets. Still, Riccardi sensed that the *Dialogo* was a thinly veiled advancement of Copernicanism that on the face of it was coming to loggerheads with the 1616 decree of which he was very cognizant. His assistant, Fr. Raffaele Visconti, was given the job to edit the book, wherein he followed the advice of Bellarmine and the 1620 censors that all references to heliocentrism should be treated as hypothetical. Even with these changes, Riccardi was still troubled, however. His dilemma was compounded by the fact that he was receiving undue pressure from other quarters, namely, the papal secretary Giovanni Ciàmpoli and the Duke of Tuscany's ambassador, Niccolini.[550] Bowing to the pressure, Riccardi granted an imprimatur to the *Dialogo* in advance, on the condition that he would revise it himself, and then pass on each revised sheet to the printer. This action, of course, was completely devoid of proper protocol and Galileo took full advantage of this breach by seeking to have the book edited and published in Florence, the haven for all things heliocentric at this point in time. Riccardi refused, but Galileo insisted that he must do so because the outbreak of the bubonic plague made it impossible to come to Rome. He also enlisted the help of the Duke, his ambassador, and the papal secretary to put more pressure on Riccardi who eventually succumbed to the "beautiful cousin Caterina who made him yield over a bottle of Chianti at a dinner table." The assigned Florentine editor, the Dominican Fr. Jacinto Stefani, made only a few minor alterations for form's sake and thus Galileo's book was left virtually intact. Riccardi tried to keep at least some control by delaying the submission of his required preface and concluding sections, but even then the subterfuge continued as Caterina was again commissioned to sway Riccardi, although he was said to be "dragged by the hair" when he finally relinquished the needed documents.[551] Needless to say, the printing of the *Dialogo* began in 1631 with the first copies being produced in February 1632. By August, Urban's Holy Office got wind of Galileo's shenanigans with Riccardi. The book was halted and confiscated and Galileo was summoned to Rome in October 1632, which he succeeded in delaying until early 1633.

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[549] *Ibid.*

[550] Finocchiaro finds that Riccardi "excused himself by saying that he has approved the publication of the Dialogue because he had received an order from the pope to do so; the pope denied it saying that these were just words, not to be trusted; but finally the Father Master produced a note by monsignor Ciampoli, secretary to the pope, in which it was stated that His Holiness (in whose presence Ciampoli claimed to be writing) was ordering him to approve the book" (*Retrying Galileo*, p. 188).

As regards Galileo's claim that he was not going against the 1616 injunction because he was not defending Copernican doctrine but "refuting it" or that he…

> …did not think it necessary to say anything, because I had no doubts about it; for I have neither maintained nor defended in that book the opinion that the Earth moves and that the sun is stationary but have rather demonstrated the opposite of the Copernican opinion, and shown that the arguments of Copernicus are weak and not conclusive…[552]

…is one of the most preposterous and risky excuses he had ever attempted to pass by the magisterium. Not only had he defended Copernicanism, but as Melchior Inchofer, one of the advisors of the Inquisition who thoroughly examined the *Dialogo*, put it:

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[551] Koestler, *The Sleepwalkers*, pp. 488-490.

[552] Original Italian: "Io non dissi cosa alcuna al P. Maestro di S. Palazzo, quando gli dimandai licenza di stampar il libro, del sodetto precetto, perchè non stimavo necessario il dirglielo, non havend'io scropolo alcuno, non havend'io con detto libro nè tenuta nè diffesa l'opinione della mobilità della terra e della stabilità del sole; anzi nel detto libro io mostro il contrario di detta opinione del Copernico, et che le ragioni di esso Copernico sono invalide e non concludenti" (*Galileo E L'Inquisizione*, p. 81).

> …if the defendant had not adhered firmly to the Copernican opinion and believed it physically true, he would not have fought for it with such asperity, nor would he have written the *Letter to the Grand Duchess*, nor would he have held up to ridicule those who maintain the accepted opinion, and as if they were dumb mooncalves [and] described them as hardly deserving to be called human beings….he holds all to be mental pygmies who are not Pythagorean or Copernican, it is clear enough what he has in mind, especially as he praises by contrast William Gilbert, a perverse heretic and a quibbling and quarrelsome defender of this opinion.[553]

Inchofer had read Galileo correctly. Although feigning capitulation, the inner Galileo believed in heliocentrism as strongly as he believed his own name. Just a few years earlier in his very long and technical 1624 reply to Francesco Ingoli (a priest who had written a 1616 essay titled: "On the Location and Rest of the Earth, Against the Copernican System"), Galileo states: "I say I have other evidences not previously observed by anyone, which are necessarily convincing about the certainty of the Copernican system."[554] Shortly before he traveled to Rome to face his second trial, he wrote to Elia Diodati in 1633 the following words concerning Libert Froidmont who wrote a book against Copernicus:

> When Froidmont or others have established that to say the earth moves is heresy while demonstrations, observations, and

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[553] Santillana, *The Crime of Galileo*, p. 267. The original Latin after the ellipsis is: "…omnes tanquam homunciones [mental pygmies] reputet, qui Pythagoraei aut Copernicani non sunt, satis evidens est quid animi great, eo praesertim quod Guilhelmum Gilbertum, haereticum perversum et huius sententiae rixosum et cavillosum patronum, nimio plus laudet ac ceteris praeferat" (*Galileo E L'Inquisizione*, p. 93). Koestler notes: "Both the judges and the defendant knew that he was lying: both the judges and he knew that the threat of torture (*territio verbalis*) was merely a ritual formula, which would not be carried out; and that the hearing was a mere formality" (*The Sleepwalkers*, pp. 499-500).

[554] Reply to Ingoli, 1624, *Le Opere di Galileo Galilei*, vol. 6, total letter contained in pages 509-561, this portion translated by M. Finocchiaro in *The Galileo Affair*, p. 182. Ingoli was the secretary to the newly created office of Congregation for the Propagation of the Faith.

> necessary conclusions show that it does move, in what swamp will he have lost himself and the Holy Church?[555]

But in front of the inquisitors Galileo adhered to his story, claiming as a final statement that he would "promise to resume the arguments already brought in favor of the said opinion which is false and has been condemned, and to confute them in such a most effectual manner."[556]

As the 1633 discovery of the second Bellarmine document shows, a written injunction was given to Galileo on February 25, 1616 not to teach the heliocentric system. As noted earlier, one of the "Dominican friars" that Galileo admits to being present at the 1616 meeting is Michelangelo Seggizi, who, as was his function as the Commissary of the Holy Office, would be the one who handed Galileo the injunction. When Galileo was finally summoned before Pope Urban, the existence and delivery of the injunction was confirmed. The 1633 sentence against Galileo stated:

> …after being informed and warned in a friendly way by the same Lord Cardinal [Bellarmine], you were given an injunction by the then Commissary of the Holy Office in the presence of a notary and witnesses to the effect that you must completely abandon the said false opinion, and that in the future you could neither hold, nor teach it in any way whatever, either orally or in writing; having promised to obey, you were dismissed.[557]

As was the case with Paul V, the present pope, Urban VIII, took the Galileo affair very seriously. There can be little doubt that Urban understood, as did his chief inquisitor, Robert Bellarmine, that nothing less than the veracity of Scripture was at stake. He was not about to let a relative upstart reverse fifteen centuries of Church teaching on little more than a scientific hunch. That the pope was interpreting Galileo's heliocentrism as a direct attack upon Scripture is noted in the text of the sentence against him that was approved by the pope:

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[555] *Le Opere di Galileo Galilei*, vol. 15, p. 25, as cited and translated in Richard Westfall's *Essays on the Trial of Galileo*, p 24. Fantoli, directing his remarks against McMullin's thesis (1967, pp. 33-34), contends that "Galileo is aware that such scientific certainty in favor of Copernicanism does not yet exist. But the least that one can say is that it remains possible in the future. Therefore, the choice between Ptolemaic view and that of Copernicus is to be left open in expectation of future 'proofs'" (*Galileo: For Copernicanism and for the Church*, p. 205). But it appears that in Galileo's characteristic duplicity, he would say whatever he could get away with, depending on the audience to whom he was speaking. If his audience believed in Copernicanism, Galileo treated Copernicanism as a scientific fact. If his audience rejected Copernicanism, Galileo would often treat it as a hypothesis.

[556] *The Crime of Galileo*, p. 277.

[557] *Le Opere di Galileo Galilei*, Antonio Favaro, vol. 19, p. 403, as cited in Fantoli, p. 137.

> …the said certificate [from Bellarmine] you produced in your defense aggravates your case further since, while it says that the said opinion is contrary to Holy Scripture, yet you dared to treat of it, defend it, and show it as probable; nor are you helped by the license you artfully and cunningly extorted since you did not mention the injunction you were under.[558]

The pope's involvement and seriousness of mind is noted in how he communicated directly and privately with the Grand Duke of Tuscany's ambassador, Francesco Niccolini, who then reported his communications back to the Grand Duke's secretary of state, Andrea Cioli. Over the period of September 1632 to June 1633 the resolve of Pope Urban VIII against both heliocentrism and Galileo was made crystal clear for both the hierarchy of the Church and the Tuscany government. Beginning on September 5, 1632, Niccolini writes to Cioli:

> Yesterday I did not have the time to report to Your Most Illustrious Lordship what had transpired (in a very emotional atmosphere) between myself and the Pope in regard to Mr. Galilei's work….I too am beginning to believe…that the sky is about to fall. While we were discussing those delicate subjects of the Holy Office, His Holiness exploded in great anger, and suddenly he told me that even our Galilei had dared enter where he should not have, in the most serious and dangerous subjects which could be stirred up at this time. I replied that Mr. Galilei had not published without the approval of his ministers….He answered, with the same outburst of rage, that he had been deceived by Galileo and Ciampoli…[559]

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[558] *Le Opere di Galileo Galilei*, vol. 19, pp. 403-404, as cited in Fantoli, p. 138.

[559] *Le Opere di Galileo Galilei*, vol. 14, p. 383, translated by Finocchiaro in *The Galileo Affair*, p. 229. Original Italian: "Non hebbi tempo hieri di rappresentar a V. S. Ill. Quell che haveva passato meco a caso il Papa con gran sentimento a proposito dell'opera del S. Galilei, et io n'hebbi cara l'oportunità, perchè potetti dir qualche cosa a S. B. medesima, ben che senza alcun profitto; e quant'a me comincio a creder anch'io, come ben dice V. S. Ill, ch'il mondo habbia a cadere. Mentre si regionava di quelle fastidiose materie del S. Offizio, proroppe S. S. in molta collera, et all'improviso mi disse ch'anche il nostro Galilei haveva ardito d'entrar dove non doveva, et in materie le più gravi e le più pericolose che a questi

Niccolini, clearly trying to make headway for Galileo, explained to Urban that Galileo's book, the *Dialogo*, was "dedicated to our Most Serene Patron," namely, the Grand Duke who, as was common in those days, had been secretly financing Galileo's work. But the pope's reply showed he was not going to budge an inch, and the reasons were theological in nature. Urban called Galileo's book nothing less than "the worst harm to religion…ever conceived." Niccolini describes the pope's reaction as follows:

> He said that he had prohibited works which had his pontifical name in front and were dedicated to himself, and that in such matters, involving great harm to religion (indeed the worst ever conceived), His Highness [the Grand Duke] too should contribute to preventing it, being a Christian prince….I retorted that…I did not believe His Holiness would bring about the prohibition of the already approved book without at least hearing Mr. Galilei first. His Holiness answered that this was the least ill which could be done to him and that he should take care not to be summoned by the Holy Office; that he has appointed a Commission of theologians and other persons versed in various sciences, serious and of holy mind, who are weighing every minutia, word for word, since one is dealing with the most perverse subject one could ever come across….Finally, he told me to write to our Most Serene Patron that the doctrine is extremely perverse, that they would review everything with seriousness, and that His Highness should not get involved but should go slow; furthermore, not only did he impose on me the secret about what he had just told me, but he charged me to report that he also was imposing it on His Highness [the Grand Duke].[560]

On September 11, Niccolini writes:

> In fact, the Pope believes that the Faith is facing many dangers and that we are not dealing with mathematical subjects here but with Holy Scripture, religion, and Faith….However, above all he

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tempi si potesser suscitare. Io replicai ch'il S. Galilei non haveva stampato senza l'approvattione di questi suoi ministry, et ch'io medesimo havevo ottenuto e mandato in costà I proemii a questo fine. Mi rispose con la medesima escandescenza, che egli et il Ciampoli l'havevano aggirata."

[560] *Le Opere di Galileo Galilei*, vol. 14, p. 384, translated by Finocchiaro in *The Galileo Affair*, p. 230.

> says, with the usual confidentiality and secrecy, that in the files of the Holy Office they have found something which alone is sufficient to ruin Mr. Galilei completely; that is, about twelve years ago, when it became known that he held this opinion and was sowing it in Florence, and when on account of this he was called to Rome, he was prohibited from holding this opinion by the Lord Cardinal Bellarmine, in the name of the Pope and the Holy Office. So he says he is not really surprised that His Highness is acting with so much concern, for he has not been told all the circumstances of this business.[561]

On September 18, Niccolini reports that the pope has no qualms about his strong reaction against Galileo:

> He [the pope] retorted that in cases where religion might suffer damage, it was less harmful to overreact occasionally than to be remiss as a result of the reasons I mentioned, and thus to endanger Christianity with some sinister opinion; furthermore, he had been told by His Holiness that, since we are dealing with dangerous dogmas, His Highness [the Grand Duke, Cosimo Medici] should put aside all respect and affection toward his Mathematician and be glad to contribute himself to shielding Catholicism from any danger.
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> I replied by again humbly begging him to consider that Mr. Galilei is Mathematician to His Highness, currently employed and salaried by him, and also universally known as such. His Holiness answered that this was another reason why he had gone out of the ordinary in this case and that Mr. Galileo was still his friend, but these opinions were condemned about sixteen years ago and Galileo had gotten himself into a fix which he could have avoided; for these subjects are troublesome and dangerous, this work of his is indeed pernicious, and the matter is more serious than His Highness thinks….Then he added, telling me to report it fully to His Most Serene Highness, that one must be careful not to let Mr. Galilei spread troublesome and dangerous opinions under the pretext of running a certain school for young people…[562]

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[561] *Le Opere di Galileo Galilei*, vol. 14, p. 388, translated by Finocchiaro in *The Galileo Affair*, pp. 232-233.

[562] *Le Opere di Galileo Galilei*, vol. 14, pp. 388-389, translated by Finocchiaro in *The Galileo Affair*, pp. 235-236.

On November 13, 1632, Niccolini again shows the pope's resolve in silencing the Copernican doctrine and bringing Galileo to trial in Rome:

> …this morning I discussed it with His Holiness himself. After mentioning that Mr. Galilei is ready to obey and to comply with what he will be ordered to do, I undertook to explain to His Holiness the same things at great length, to move him to pity poor Mr. Galileo, who is now so old and whom I love and adore….However, His Holiness told me that…there was no way of avoiding Mr. Galilei's coming to Rome…for indeed it was necessary to examine him personally, and that God would hopefully forgive his error of having gotten involved in an intrigue like this after His Holiness himself (when he was cardinal) had delivered him from it….Finally, he reiterated that one is dealing with a very bad doctrine.[563]

On February 27, 1633, just a few months now before Galileo's trial, Niccolini reiterates the pope's resolve:

> Then he [the pope] went on to say that, in short, Mr. Galilei had been ill-advised to publish these opinions of his, and it was the sort of thing for which Ciampoli was responsible….His Holiness gives the impression that Mr. Galileo's doctrine is bad and that he even believes it, the task is not easy….His Eminence [Cardinal Antonio Barberini, brother of the pope] replied that he felt warmly toward Mr. Galilei and regarded him as an exceptional man, but this subject is very delicate for it involves the possibility of introducing some imaginary dogma into the world…[564]

As the time gets nearer to the trial, Pope Urban's resolve seems to strengthen even more. On March 13, 1633, Niccolini writes:

> I replied that I hoped His Holiness would double the obligation imposed on His Highness by exempting him from this [the trial]….but he again said he does not think there is any way out, and may God forgive Mr. Galilei for having meddled with these subjects. He added that one is dealing with new doctrines and

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[563] *Le Opere di Galileo Galilei*, vol. 14, pp. 428-429, translated by Finocchiaro in *The Galileo Affair*, pp. 238-239.

[564] *Le Opere di Galileo Galilei*, vol. 15, p. 55-56, translated by Finocchiaro in *The Galileo Affair*, pp. 245-246.

> Holy Scripture, that the best course is to follow the common opinion since he too is attracted to them and is a friend of the new philosophy; further, Mr. Galileo had been his friend, they have conversed and dined several times together familiarly, and he was sorry to have to displease him, but one was dealing with the interests of the faith and religion. I think I went on to add that if he is heard, he will easily give every satisfaction, though with the proper reverence which is due the Holy Office. He replied that Mr. Galilei will be examined in due course, but there is an argument which no one has ever been able to answer: that is, God is omnipotent and can do anything; but if He is omnipotent, why do we want to bind him? I said that I was not competent to discuss these subjects, but I had heard Mr. Galilei himself say that first he did not hold the opinion of the earth's motion as true and then that since God could make the world in innumerable ways, one could not deny that He might have made it this way. However, he got upset and told me that one must not impose necessity on the blessed God; seeing that he was losing his temper, I did not want to continue discussing what I did not understand, and thus displease him, to the detriment of Mr. Galilei.[565]

On April 9, 1633, Niccolini adds the same. By this time Galileo is suffering from arthritis:

> However, I could hide neither the ill health of this good old man, who for two whole nights had constantly moaned and screamed on account of his arthritic pains….This morning I spoke to His Holiness about it, and, after I expressed appropriate thanks for the advance notice he was so kind to give me, His Holiness said he was sorry that Mr. Galilei had gotten involved in this subject, which he considers to be very serious and of great consequence for religion. Nevertheless, Mr. Galilei tries to defend his opinions very strongly; but I exhorted him…not to bother maintaining them and to submit to what he sees they want him to hold or believe about that detail of the earth's motion. He was extremely distressed by this, and, as far as I am concerned, since yesterday he looks so depressed that I fear greatly for his life.[566]

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[565] *Le Opere di Galileo Galilei*, vol. 15, p. 67-68, translated by Finocchiaro in *The Galileo Affair*, p. 247.

[566] *Le Opere di Galileo Galilei*, vol. 15, p. 84-85, translated by Finocchiaro in *The Galileo Affair*, p. 249.

On June 19, 1633, Niccolini reveals that it is the pope himself that formulated the conclusion that Galileo's cosmology was "erroneous and contrary to Holy Scripture":

> This morning His Holiness displayed very friendly feelings in innumerable ways….Again I pleaded that Mr. Galilei's trail be brought to an end….However, he said that in regard to the issue, there is no way of avoiding prohibiting that opinion, since it is erroneous and contrary to the Holy Scripture dictated by the mouth of God; and in regard to the person, as ordinarily and usually done, he would have to remain imprisoned here for some time because he disobeyed the orders he received in the year 1616.[567]

Niccolini's revelation about the pope's decision coincides with the minutes of the Inquisition's June 16, 1633 meeting which "reported a papal decision outlining the conclusion of the trial, including an injunction to never again discuss the topic on pain of being treated as a relapsed heretic."[568]

The Sentence and Punishment of Galileo

On Wednesday, June 22, 1633, with Galileo dressed in a white shirt to symbolize penitence, he knelt as the full text of the final sentence against him was read: [NB: the more significant parts are underlined and footnoted in the original Italian]

> **Sentence**: Whereas you, Galileo, son of the late Vincenzo Galilei, Florentine, age seventy years, were in the year 1615 denounced to this Holy Office for holding as true the false doctrine taught by some that the sun is the center of the world and immovable and that the Earth moves, and also with diurnal motion;[569] for having disciples to whom you taught the same doctrine; for holding correspondence with certain mathematicians of Germany concerning the same; for having printed certain letters, entitled "On the Sunspots," wherein you

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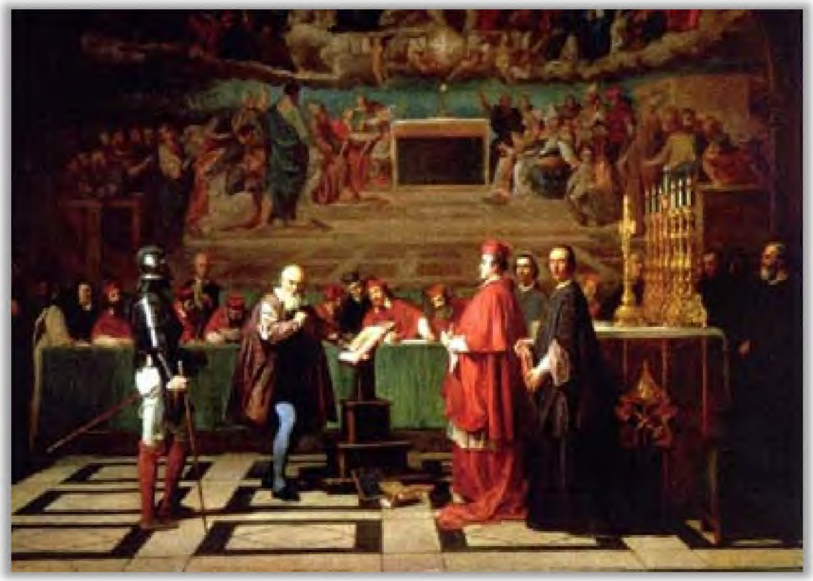
[567] *Le Opere di Galileo Galilei*, vol. 15, p. 160, translated by Finocchiaro in *The Galileo Affair*, p. 255.

[568] As noted by Finocchiaro in *Retrying Galileo*, p. 272.

[569] "falsa dottrina, da alcuni insegnata, ch'il sole sia centro del mondo et imobile, e che la terra si muova anco di moto diurno" (*Galileo E L'Inquizizione*, Favaro, p. 143).

> developed the same doctrine as true; and for replying to the objections from the Holy Scriptures, which from time to time were urged against it, by glossing the said Scriptures according to your own meaning:[570] and whereas there was thereupon produced the copy of a document in the form of a letter, purporting to be written by you to one formerly your disciple, and in this divers propositions are set forth, following the position of Copernicus, which are contrary to the true sense and authority of Holy Scripture:[571]



Analysis: The seriousness with which Urban VIII had conducted the preliminary judgments against Galileo are now carried over and formalized in the final sentence. Note that both the revolution of the Earth around the sun and the rotation of the Earth on its axis are condemned. From the outset we see why the pope and his Holy Office considered this case one of the most serious issues facing the Church and why they spent so much time and energy to suppress it. The main issue is the veracity of Holy Scripture, something which Galileo "glossed" over with his "own meaning," and therefore did not discover its "true sense." Again, we need to be reminded that the pope and his Holy Office were certainly aware of the theoretical possibility of interpreting Scripture's cosmological passages in a figurative sense. It is not as if these clerics were blinded by having known only one methodology of biblical interpretation. The Alexandrian school of exegesis one thousand years prior had inundated the Church with all kinds of allegorical and figurative interpretations of Scripture, which also carried over into the medieval age. The early Fathers themselves were deep into mystical meanings and biblical numerology. But when it came to interpreting Scripture's cosmology, not a one of them dared turn it into figurative expression. Something held them back from doing so, and we are confident to say that it was the Holy Spirit who guides the Church in her doctrinal proclamations.

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[570] "rispondevi glosando detta Scrittura conforme al tuo senso" (*ibid*).

[571] "si contengono varie propositioni contro il vero senso et auttorità della Sacra Scrittura" (*ibid*).

Galileo tried his best to get around this immovable obstacle. At one point he reinvented how the Church should regard the testimony of the Fathers, saying we were bound

> …only to those conclusions which the Fathers discussed and inspected with great diligence and debated on both sides of the issue and for which they then all agreed to reject one side and to hold the other. However, the earth's motion and sun's rest are not of this sort, given that in those times this opinion was totally forgotten as far from academic dispute and was not examined, let alone followed, by anyone; thus one may believe that the Fathers did not even think of discussing it…. Therefore, it is not enough to say that all the Fathers accept the earth's rest, etc., and so it is an article of faith to hold it; rather one would have to prove that they condemned the contrary opinion. For I can always say that their failure to reflect upon it and discuss it made them leave it stand as the current opinion, but not as something resolved and established.[572]

Galileo was on his usual fishing expedition, but it happened to be in a poisoned lake. From treating the Fathers as being ignorant of astronomy, to claiming that because they didn't "debate" geocentrism this now allows us to depart from their consensus, he has tried every possible means to escape their holy grip on his fortunes. In actuality, the Fathers did little debating amongst themselves on any topic. Their writings were preponderantly concerning debates with and about heretics and apostates. They even titled many of their works against the heretics they fought (*e.g.*,

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[572] *Le Opera di Galileo Galilei*, vol. 5, pp. 335-336, translated by Finocchiaro, cited in *Galileo: For Copernicanism*, pp. 201-202.

Irenaeus' *Against Heresies*, Augustine's *Against Manicheus*, Basil's *Against Eunomius*). Moreover, if the Fathers had been in debate amongst themselves it would have meant there was a controversy, and controversy creates doubt, and doubt leads to no consensus. But the reality is, the Fathers wrote over a span of about 600 years and from widely separated lands with very infrequent communications. Interestingly enough, with what little correspondence they could generate with one another, it is remarkable to see how much agreement they maintained over the doctrines of the Christian faith.

When it came to the issue of geocentrism, it was not, as Galileo would have it, that the Fathers just accepted this doctrine in a vacuum without any opposing propositions. Since Galileo hardly read the Fathers, he would have missed the frequent debates and admonitions they raised in their writing against the speculative science of the Greeks, including the push for evolution and heliocentrism in the Pythagorean school.

The only time the Church's leaders entered into intense debates was in sessions of an ecumenical council. But even then, what was resolved in the council chambers was that Catholics were obligated to adhere to the consensus of the Fathers. The obligation was reiterated at the Council of Trent, which was about sixty years prior to Galileo's above proposals on how to regard the patristics. Rest assured, no council ever stated that Catholics should listen to the consensus of the Fathers only after they had strenuous debate over a certain topic. It was Trent's belief that the Holy Spirit was guiding the Church, and if she was guided in such a way that all her major theologians taught one belief, it was a sure sign that divine providence was at work.

> **Sentence**: This Holy Tribunal being therefore of intention to proceed against the disorder and mischief thence resulting, which went on increasing to the prejudice of the Holy Faith, by command of His Holiness and of the Most Eminent Lords Cardinals of this supreme and universal Inquisition,[573] the two propositions of the stability of the sun and the motion of the Earth were by the theological Qualifiers qualified as follows:

Analysis: We note here that the Inquisition is understood as having "supreme" authority and "universal" jurisdiction. During this day and time when a close relationship existed between the civil magistrate and the ecclesiastical authorities, no one was exempt from the investigations and decisions of the Inquisition. This implies that, even though the decision against Copernicanism was directed against particular individuals

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[573] "di questa Suprema et Universale Inq.^{ne}" (*ibid.*).

(Foscarini, Galileo, Kepler, *et al.*), it applied to anyone in the world who might attempt to preach the same heliocentric doctrine. If such an attempt were made, another tribunal of the Inquisition would have been set up to deal with it. If a great number of individuals made such an attempt, the Church would most likely settle them all at once by making a formal and binding declaration to all the Christian faithful that no one is permitted to hold or teach that the Earth moves. Such a formal declaration is still a possibility. The passage of time, including the 375 years since the 1633 edict against Galileo, really has no effect on what may happen in the future. At any time it is so led, the Church could declare geocentrism as a formally infallible and binding doctrine on the whole Church. There are many examples of doctrines which, having been believed and practiced in the early centuries of the Church, were not formalized into dogmatic proclamations until hundreds or even thousands of years later (*e.g.*, transubstantiation, the canon of Scripture, justification, the Immaculate Conception of Mary, the Assumption of Mary). The unique quality of geocentric doctrine is that it possesses what the Church would consider the strongest possible evidence for declaring it a dogma of the Church. It has: (a) an indisputable consensus among the Fathers and medievals; (b) Scripture's exclusive testimony, in dozens of passages written in various ways, that declare the sun moves and the Earth is fixed; (c) high level magisterial decisions, enjoined, facilitated and authoritatively endorsed by several popes, that declare heliocentrism a formal heresy, opposed to Scripture, and a pernicious error. The only thing left to convince a doubting Thomas is the scientific evidence. With the very tools provided by modern science, we have painstakingly demonstrated that modern science has both no proof for heliocentrism and abundant evidence for geocentrism, facts which it is reticent to reveal to the public because of its admitted philosophical bias against doing so.

> **Sentence**: The proposition that the sun is the center of the world and does not move from its place is absurd and false philosophically and formally heretical, because it is expressly contrary to the Holy Scripture.[574]

Analysis: Here we see that even though Pope Paul V's 1616 injunction against Galileo did not use the word "heresy" that was recommended by the eleven cardinals who formed the papal investigatory commission, the term is here resurrected and applied in 1633, only this time it is increased to the level of being "formally" heretical, as opposed to, we assume, being materially heretical. Note that the judgment is not directed merely against Galileo; rather, the entire "proposition" of a non-moving sun, no matter who may countenance such a belief, is declared "formally heretical." Hence, anyone who would adopt heliocentrism would automatically open themselves up to the judgment of formal heresy, based on this 1633 sentence. For more clarification on the canonical meaning of these terms, Fr. Jerome Langford elaborates:

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[574] "Che il sole sia centro del mondo et imobile di moto locale, è propositione assurda e falsa in filosofia, e formalmente heretica, per essere espressamente contraria alla Sacra Scrittura (*ibid.*).

> The theologian Antonio of Cordova, writing in 1604, explains the generic meaning of these censures. The "formally heretical" in the first censure means that this proposition was considered directly contrary to a doctrine of faith. This shows that the apparent affirmations of Scripture and the Fathers, that the sun moves, was held by the Consultors to be a doctrine of faith. In other words, there is no room for apologetic excursions here. The Consultors tagged the proposition with the strongest possible censure, as being directly contrary to the truth of Sacred Scripture. In the second proposition, the motion of the earth was censured as "erroneous in the faith." This meant that the Consultors considered it to be not directly contrary to Scripture, but opposed to a doctrine which pertained to the faith according to the common consensus of learned theologians. In other words, Scripture was not as definite in stating the immobility of the earth. But the Holy Writ did reveal that the sun moved, and since human reason could conclude that the sun and the earth were not both moving around each other, the Consultors felt that the immobility of the earth was a matter which fell under the domain of faith indirectly, as a kind of theological conclusion.[575]
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> **Sentence**: The proposition that the Earth is not the center of the world and immovable but that it moves, and also with a diurnal motion, is equally absurd and false philosophically and theologically considered at least erroneous in faith.[576]

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[575] Jerome J. Langford, *Galileo, Science and the Church*, foreword by Stillman Drake, NY: Desclee Co., 1966, pp. 89-90, cited in Paula Haigh's private paper, *Galileo's Heresy*, p. 3.

[576] "Che la terra non sia centro del mondo nè imobile, ma che si muova etiandio di moto diurno, è parimente propositione assurda e falsa nella filosofia, e considerate in teologia ad minus erronea in Fide" (*ibid.*).

Analysis: A non-central, moving Earth, similar to a non-moving sun, is judged as "absurd" and "false philosophically." The word "absurd" is employed because of the simple logic involved. If the sun moves around the Earth, then logically the Earth cannot move around the sun. It is a simple matter of choosing the right system. If A is right, it would be absurd to adopt B. "False philosophically" refers to the fact that the Pythagorean school of philosophy had adopted heliocentrism in opposition to the philosophical school of Aristotle. In medieval times, "philosophy" was a much more general term than its usage today. Lastly, the change from "formally heretical" with regard to the movement of the sun, to "at least erroneous in faith" with regard to movement of the Earth seems a bit inconsistent but there is a reason for it. First, as noted earlier, the Church admitted that certain Scriptures might possibly be interpreted as referring to the stability of the Earth as opposed to its being immobile in space. As such, it would not be formally heretical to say that Psalm 104, for example, was speaking about Earth's longevity in time rather than its position in space. But since it was certain that the sun revolved around the Earth, it would still be "at least erroneous in faith" for one to claim that the Earth moved since obviously only one body can be revolving around the other. Second, normally ecclesiastical censures will be issued at three distinct levels of severity: (a) heresy; (b) erroneous in faith; (c) rashness. The difference between (a) and (b) in the case of Galileo is that there was some doubt about whether Galileo actually held, at least in the absolute sense, to the concepts that he put in his *Dialogo* since he sometimes gave the impression they were hypothetical. As such, Galileo is convicted for being "vehemently suspected of heresy" (see below) as opposed to being in actual heresy. This allows the sentence to maintain, on the one hand, that sun-fixed or that earth-moving cosmologies are, *de facto*, "formally heretical," and, on the other hand, allow room for judging whether the penitent really knew and believed what he was saying. Coinciding with this principle is the phrase "vehemently" in the statement "vehemently suspect of heresy," indicating the bare minimum of conviction that is assigned to Galileo and implying he is only a hair's breadth from being in the category of formal heresy. In any case, since Galileo was only suspected of heresy, he is then required to write a formal abjuration of his views, whereas if he were convicted of either "heresy" or "rashness" no abjuration would have been required.

> **Sentence**: But whereas it was desired at that time to deal leniently with you, it was decreed at the Holy Congregation held

> before His Holiness on 25 February 1616,[577] that his Eminence the Lord Cardinal Bellarmine should order you to abandon altogether the said false doctrine and, in the event of your refusal, that an injunction should be imposed upon you by the Commissary of the Holy Office to give up the said doctrine and not teach it to others, not to defend it, nor even discuss it;[578] and failing your acquiescence in this injunction, that you should be imprisoned. And in execution of this decree, on the following day, at the Palace, and in the presence of his Eminence, the said Lord Cardinal Bellarmine, after being gently admonished by the said Lord Cardinal, the command was enjoined upon you by the Father Commissary of the Holy Office of that time, before a notary and witnesses,[579] that you were altogether to abandon the said false opinion and not in future to hold or defend or teach it in any way whatsoever,[580] neither verbally nor in writing; and, upon your promising to obey, you were dismissed.

Analysis: The close involvement of Pope Paul V is duly noted, as well as the written legal injunction that is stated to have been given to Galileo by the Commissary of the Holy Office, not, as Galileo had claimed, verbally given to him by Cardinal Bellarmine. The proof that it was written is noted by the sentence's appeal to the "notary and witnesses" who would be required to sign their names to the injunction. The injunction specifies that Galileo was not to disseminate the heliocentric system "in any way whatsoever," which obviously included making theatrical musings of the opposing forces in the debate, as was the case in his *Dialogo*.

> **Sentence**: And, in order that a doctrine so pernicious might be wholly rooted out and not insinuate itself further to the grave prejudice of Catholic truth,[581] a decree was issued by the Holy Congregation of the Index prohibiting the books which treat of

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[577] "fu decretata nella Sacra Congre.^{ne} tenuta avanti N. S. a' 25 di Febr.^{o} 1616" (*ibid*). "N.S." is the abbreviation for "His Holiness" used each time it appears in the decree.

[578] "che dal Comissario del S. Off.^{o} ti dovesse esser fatto precetto di lasciar la detta dotrina, e che non potessi insegnarla ad altri nè difenderla nè trattarne" (*ibid.*).

[579] "benignamente avvisato et amonito, ti fu dal P. Comissario del S. Off.^{o} di quell tempo fatto precetto, con notaro e testimoni" (*ibid.* p. 144).

[580] "in qualsivoglia modo" (*ibid.*).

[581] "Et acciò che si togliesse affatto così perniciosa dottrina, e non andasse più oltre serpendo in grave pregiuditio della Cattolica verità" (*ibid.*)

> this doctrine and declaring the doctrine itself to be false and wholly contrary to the sacred and divine Scripture.[582]

Analysis: Here we must realize that the pope and the Holy Office are not trying to dress up their convictions with a superfluity of convincing words; rather, they are expressing their deepest and most solemn concerns about an error they know in their heart of hearts could break the very foundations of Christianity, mainly because of the direct attack on the veracity and proper interpretation of Scripture that the Galileo affair would unleash upon mankind unless it were properly identified and summarily curtailed. Like a dragon that must be cast into the bottomless pit and sealed over so that it cannot escape, so the magisterium of the 17th century, given the task by God himself to set the precedent for ages to come, viewed the "pernicious" doctrine of Galileo as one of the greatest threats ever to face the Church. Like a cancer waiting to metastasize, the doctrine of Galileo had to be "wholly rooted out" before it sucked the life out of the Church. As we have seen earlier in analyzing the Church's subsequent decisions, the judgments against the heliocentric system as being "formally heretical" and "opposed to Scripture" have never been officially overturned, even though, by some sleight of hand concerning the dubious claims of stellar parallax in the 1830s Copernicus and Galileo managed to get their books off the Index. The fact is, however, that the Index, although it is related to the injunction of 1616 and the sentence of 1633, is a separate document with its own life and death, as it were. As such, dispensing with the Index or removing names from it does not dispense with the formal judgment that the magisterium made against the heliocentric theory itself. The sentence of 1633 makes clear that there are two separate but related issues at stake. The first deals with the fallacious tenets of heliocentrism itself; the second deals with what Galileo believed and taught and how he was to be censured. The sentence makes clear that there is no negotiation on the first issue, and on the second it decided to give a more lenient judgment. It is only the second of these issues that is up for discussion in the following years. The first issue has never come up for discussion again, save the commission John Paul II formed in 1981 and the informal address he subsequently gave to the Pontifical Academy of Science in 1992 but which made no official attempt to overturn previous magisterial decisions on the theological status of heliocentrism.

> **Sentence**: And whereas a book appeared here recently, printed last year at Florence, the title of which shows that you were the

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[582] "et essa dichiarata falsa et omninamente contraria alla Sacra et divina Scrittura" (*ibid.*).

> author, this title being: "Dialogue of Galileo Galilei on the Great World Systems: Ptolemy and Copernicus"; and whereas the Holy Congregation was afterwards informed that through the publication of the said book the false opinion of the motion of the Earth and the stability of the sun was daily gaining ground,[583] the said book was taken into careful consideration, and in it there was discovered a patent violation of the aforesaid injunction that had been imposed upon you, for in this book you have defended the said opinion previously condemned and to your face declared to be so, although in the said book you strive by various devices to produce the impression that you leave it undecided, and in express terms probable:[584] which, however, is a most grievous error, as an opinion can in no wise be probable which has been declared and defined to be contrary to divine Scripture.[585]

Analysis: After "weighing every minutia, word for word" of Galileo's book, the outcome was predictable, but the language used to condemn it was not. Here in the final sentence approved by the pope even the "probability" of heliocentrism is categorized as "an opinion declared and defined contrary to Divine Scripture." This was the same argument that Cardinal Bellarmine had given Galileo in 1616 when he explained to him that, based on the veracity of Scripture and the consensus of the Fathers, not only did no person bring proof of heliocentrism to him, he did not believe that any person *could* do so.[586] Pope Urban's 1633 judgment seems to go one step further than Bellarmine's, for it declares that heliocentrism is not even to be considered probable, thus curtailing all claims to those having scientific proof to support it. In drawing this line in the sand the sentence uses language that is normally reserved for decisions that possess a very high degree of authority in dogmatic proclamations, that is, Urban VIII approves and facilitates language saying that heliocentrism is "*declared* and *defined* contrary to Divine Scripture." When a controversial issue is "defined" it is more or less set in stone, unless a higher authority changes it. In that case, only a formal and universal statement given *ex cathedra* by Pope Urban, or a future pope, would have had higher authority to do so, and, needless to say, no such *ex cathedra* pronouncement has ever been made.

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[583] "che con l'impressione di detto libro ogni giorno più prendeva piede e si disseminava la falsa opinione del moto della terra e stabilità del sole" (*ibid.*).

[584] "avvenga che tu in detto libro con varii ragiri ti studii di persuadere che tu la lasci come indecisa et espressamente probabile" (*ibid.*).

[585] "non potendo in niun modo esser probabile un'opinione dichiarata e difinita per contraria alla Scrittura divina" (*ibid.*).

[586] Bellarmine stated: "But I will not believe that there is such a demonstration, until it has been shown to me. To demonstrate that the assumption that the sun is located in the center and the earth in the heavens saves the appearances is not the same thing as to demonstrate that in truth the sun is located in the center and the earth in the heavens. The first demonstration, I believe, can be given; but I have the greatest doubts about the second. And in case of doubt one should not abandon the Sacred Scriptures as interpreted by the Holy Fathers."

> **Sentence**: Therefore by our order you were cited before this Holy Office, where, being examined upon your oath, you acknowledged the book to be written and published by you. You confessed that you began to write the said book about ten or twelve years ago [1621-1623], after the command had been imposed upon you as above; that you requested license to print it without, however, intimating to those who granted you this license that you had been commanded not to hold, defend, or teach the doctrine in question in any way whatever.

Analysis: This means that Galileo, in his typical temerity, began writing the *Dialogo* just five to seven years after the injunction had been given to him in 1616. In fact, parts of the *Dialogo* were written as far back as 1610.[587] The timing would put a dim light on Galileo's 1633 excuse that he did not "recall" receiving the injunction from the Holy Office since a lapse of memory could hardly be the case for one of the most serious moments in his life. Perhaps with malice aforethought Galileo began writing the *Dialogo* in hopes that the tide against him would someday turn. Or even more likely, Galileo got wind of the decision by the magisterium in 1620 to allow the publishing of Copernicus' book, *De revolutionibus*, if the proper corrections were added that would clearly make heliocentrism a hypothesis rather than give any hint that it was a scientific fact. Bellarmine had already suggested this approach both to Foscarini and Galileo, so it is not surprising that it was applied just a few years later.[588] On May 15, 1620, the "List of the corrections of the work *De revolutionibus orbium celestium* of Nicholas Copernicus" was released. Nine corrections were amended to the original text. One example of a correction (see facsimile on next page) regards Copernicus' statement in Book 1, Chapter 9:

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[587] Arthur Koestler, *The Sleepwalkers*, p. 605.

[588] Gingerich posits this possible motivation: "*De revolutionibus* included observations of the Sun and Moon, of potential value to the Church, so it was inadvisable to ban the book outright. Nor could the heliocentrism simply be excised, for it was too firmly embedded in the text. The only path was to change a few places to make it patently obvious that the book was to be considered strictly hypothetical" (*The Book that Nobody Read*, p. 144).

"Therefore, since nothing hinders the mobility of the Earth, I think we should now see whether more than one movement belongs to it, so that it can be regarded as one of the wandering stars"[589] as it appeared in the 1617 edition of *De Revolutionibus* by Nicolai Mulerii, published in Amsterdam. Mulerii shows the line in which the censor crossed out the above sentence and changed it in the margin, which then read: "Therefore, with the *assumption* that the earth moves, I think we should now see whether more than one movement belongs to it…"[590]

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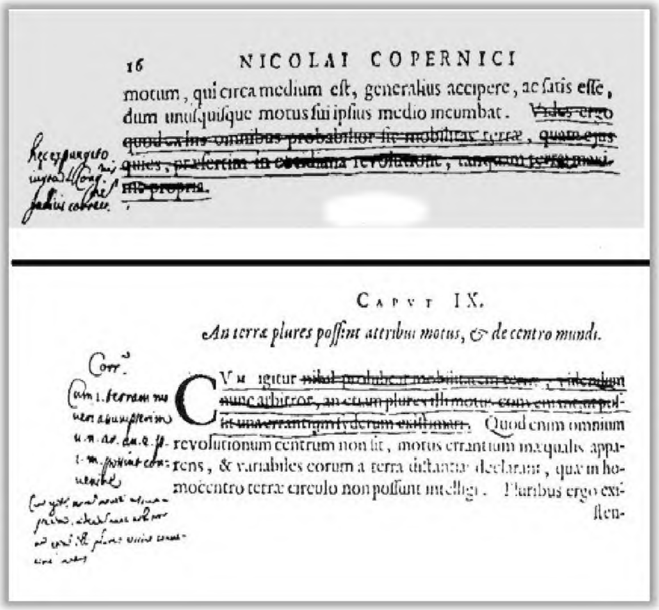
[589] Cum igitur nihil prohibet mobilitatem terra, videndum nunc arbitror, an etiam plures illi motus convenire ut poffint una errantium siderum enuntiare.

[590] "Cum igitur terram moveri assumpserim, videndum nunc arbitror, an etiam illi plures possint convenire motus…" The correction is also noted in Favaro's *Galileo e l'Inquisizione,* p. 141. Gingerich notes the correction in Book 1, chapter 11, from Galileo's personal copy of *De revolutionibus* which reads: "De triplici motu telluris demonftratio" ("The Demonstration of the Three-Fold Motion of the Earth") was crossed out and replaced with "De hypothesi triplicis motus terre ciusq demonstratione" ("The Hypothesis of the Three-Fold Motion of the Earth and its Demonstration"). Other corrections include: (1) In the Preface where Copernicus says: "There may be triflers who though wholly ignorant of mathematics nevertheless abrogate the right to make judgments about it because of some passage of Scripture wrongly twisted to their purpose, and will dare to criticize and censure this undertaking of mine. I waste no time on them, and indeed I despise their judgment as thoughtless…" This paragraph was to be deleted. (2) In Bk. 1, Ch. 1, p. 6 (corrected by Favaro to Bk. 1, Ch. 5, p. 3) Copernicus states: "Among the authorities it is generally agreed that the Earth is at rest in the middle of the universe, and they regard it as inconceivable and even ridiculous to hold the opposite opinion. However, if we consider it more closely the question will be seen to be still unsettled, and so decidedly not to be despised." This was to be changed to: "However, if we consider the question more closely, we think it is immaterial whether the Earth is placed at the center of the world or away from the center, so long as one saves the appearances of celestial motion." (3) All of chapter 8 was problematic because it spoke explicitly of the earth's motion and refuted arguments for its rest. Corrections were made to pages 6 and 7 making the chapter hypothetical. (4) In Ch. 10, p. 9 Copernicus wrote: "Consequently we should not be ashamed to admit that everything that the Moon encircles, including the center of the Earth, passes through that great sphere between the other wandering stars in an annual revolution around the Sun, and the center of the universe is in the region of the Sun." In this case the word "admit" was to be changed to "assume." In the same place, Copernicus wrote: "That the Sun remains motionless and whatever apparent motion the Sun has is correctly attributed to the motion of the Earth." In this case, the word "correctly" was to be changed to "consequently." (5) In Ch. 10, p. 10, the words "Such truly is the size of this structure of the Almighty's," since in the preceding words Copernicus claims that the stars are far away and do not move. (6) In Bk. 4, Ch. 20, p. 122, the title: "The size of these three stars, the Sun, the Moon, and the Earth, and a



16 NICOLAI COPERNICI

motum, qui circa medium eſt, generalius accipere, ac ſatis eſſe, dum unuſquiſque motus ſui ipſius medio incumbat. ~~Vides ergo quod ex his omnibus probabilior ſit mobilitas terræ, quam eius quies, præſertim in cotidiana revolutione, tanquam terræ maxime propria.~~

CAPVT IX.

An terræ plures poſſint attribui motus, & de centro mundi.

Corr.

CVM igitur ~~nihil prohibet mobilitatem terræ, videndum nunc arbitror, an etiam plures illi motus conveniant, ut poſſit una errantium ſyderum exiſtimari.~~ Quod enim omnium revolutionum centrum non ſit, motus errantium inæqualis apparens, & variabiles eorum a terra diſtantiæ declarant, quæ in homocentro terræ circulo non poſſunt intelligi. Pluribus ergo exiſten-

Official corrections to Copernicus' *De revolutionibus*

Sentence: You likewise confessed that the writing of the said book is in many places drawn up in such a form that the reader might fancy that the arguments brought forward on the false side are calculated by their cogency to compel conviction rather than to be easy of refutation, excusing yourself for having fallen into an error, as you alleged, so foreign to your intention, by the fact that you had written in dialogue and by the natural complacency that every man feels in regard to his own subtleties and in showing himself more clever than the generality of men in devising, even on behalf of false propositions, ingenious and plausible arguments.

And, a suitable term having been assigned to you to prepare your defense, you produced a certificate in the handwriting of his

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comparison of them with each other," was to delete "these three stars" since the Earth was not a star. These corrections were signed in Rome at the Apostolic Palace on May 20, 1620 by Fr. Franciscus Capiferreus, O.P., Secretary of the Holy Congregation of the Index. A complete list in the original Latin is in Favaro's *Le Opera di Galileo Galilei*, vol. 19, pp. 400-401.

Eminence the Lord Cardinal Bellarmine, procured by you, as you asserted, in order to defend yourself against the calumnies of your enemies, who charged that you had abjured and had been punished by the Holy Office, in which certificate it is declared that you had not abjured and had not been punished but only that the declaration made by His Holiness and published by the Holy Congregation of the Index had been announced to you, wherein it is declared that the doctrine of the motion of the Earth and the stability of the sun is contrary to the Holy Scriptures and therefore cannot be defended or held.[591] And, as in this certificate there is no mention of the two articles of the injunction, namely, the order not "to teach" and "in any way," you represented that we ought to believe that in the course of fourteen or sixteen years you had lost all memory of them and that this was why you said nothing of the injunction when you requested permission to print your book.[592] And all this you urged not by way of excuse for your error but that it might be set down to a vainglorious ambition rather than to malice. But this certificate produced by you in your defense has only aggravated your delinquency, since, although it is there stated that said opinion is contrary to Holy Scripture, you have nevertheless dared to discuss and defend it and to argue its probability;[593] nor does the license artfully and cunningly extorted by you avail you anything, since you did not notify the command imposed upon you.

And whereas it appeared to us that you had not stated the full truth with regard to your intention, we thought it necessary to subject you to a rigorous examination at which (without prejudice, however, to the matters confessed by you and set forth as above with regard to your said intention) you answered like a good Catholic. Therefore, having seen and maturely considered the merits of this your case, together with your confessions and excuses above-mentioned, and all that ought justly to be seen

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[591] "la dichiaratione fatta da N. S.^{e} e publicata dalla Sacra Congre.^{ne} dell'Indice, nella quale si contiene che la dottrina del moto della terra e della stabilità del sole sia contraria alle Sacre Scritture, e però non si possa difendere nè tenere" (*ibid.*, p. 145).

[592] "e che per questa stessa cagione havevi taciuto il precetto quando chiedesti licenza di poter dare il libro alle stampe" (*ibid.*).

[593] "hai non di meno ardito di trattarne, di difenderla e persuaderla probabile" (*ibid.*).

> and considered, we have arrived at the underwritten final sentence against you:
>
> Invoking, therefore, the most holy name of our Lord Jesus Christ and of His most glorious Mother, ever Virgin Mary, by this our final sentence, which sitting in judgment, with the counsel and advice of the Reverend Masters of sacred theology and Doctors of both Laws, our assessors, we deliver in these writings, in the cause and causes at present before us between the Magnificent Carlo Sinceri, Doctor of both Laws, Proctor Fiscal of this Holy Office, of the one part, and you Galileo Galilei, the defendant, here present, examined, tried, and confessed as shown above, of the other part –
>
> We say, pronounce, sentence, and declare[594] that you, the said Galileo, by reason of the matters adduced in trial, and by you confessed as above, have rendered yourself in the judgment of this Holy Office vehemently suspected of heresy,[595] namely, of having believed and held the doctrine – which is false and contrary to the sacred and divine Scriptures – that the sun is the center of the world and does not move from east to west and that the Earth moves and is not the center of the world;[596] and that an opinion may be held and defended as probable after it has been declared and defined to be contrary to the Holy Scripture;[597] and that consequently you have incurred all the censures and penalties imposed and promulgated in the sacred canons and other constitutions, general and particular, against such delinquents. From which we are content that you be absolved, provided that, first, with a sincere heart and unfeigned faith, you abjure, curse, and detest before us the aforesaid errors and heresies[598] and every other error and heresy contrary to the Catholic and Apostolic Roman Church in the form to be prescribed by us for you.

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[594] "Diciamo, pronuntiamo, sententiamo e dichiaramo" (*ibid.*).

[595] "vehementemente sospetto d'heresia" (*ibid.*).

[596] "falsa e contraria alle Sacre e divine Scritture, ch'il sole sia centro della terra e che non si muova da oriente ad occidente, e che la terra si muova e non sia centro del mundo" (*ibid.*).

[597] "dopo esser stata dichiarata e diffinita per contraria alla Sacra Scrittura" (*ibid.*).

[598] "li sudetti errori et heresie" (*ibid.*, pp. 145-146).

Analysis: Once again it is made clear that the notion of a moving Earth and a fixed sun is to be categorized as a "heresy," and its opposition to Scripture is duly "declared and defined." This is direct and unambiguous language. The only saving grace for Galileo is that his judgment is lessened to one who is "*vehemently suspected* of heresy" but only because the Holy Office cannot determine whether Galileo had deliberately gone against the will of the pope. In effect, the sentence decided two related but separate issues. It made a formal declaration that heliocentrism is a "heresy," and it determined that Galileo's condemnation falls just short of embracing that heresy. Irrespective of what happens to Galileo, the fact remains that the highest authority in the Church of that day – the Holy Office under the direction and approval of the reigning pontiff – had declared heliocentrism heretical. Although names of individuals and their books would eventually be removed from the Index, the formal declaration that heliocentrism is heretical has never officially been rescinded by any other pope or his Holy Office. The extent to which the Christian faithful are presently bound by this set of facts is something that must be decided by the magisterium itself.

> **Sentence**: And, in order that this your grave and pernicious error and transgression may not remain altogether unpunished and that you may be more cautious in the future and an example to others that they may abstain from similar delinquencies, we ordain that the book of the "Dialogue of Galileo Galilei" be prohibited by public edict.
>
> We condemn you to the formal prison of this Holy Office during our pleasure, and by way of salutary penance we enjoin that for three years to come you repeat once a week the seven penitential Psalms. Reserving to ourselves liberty to moderate, commute, or take off, in whole or in part, the aforesaid penalties and penance.
>
> And so we say, pronounce, sentence, declare, ordain, and reserve in this and in any other better way and form which we can and may rightfully employ.[599]

On June 22, 1633, because he was "vehemently suspected" of holding the "formal heresy" that the sun was fixed and the Earth moved, the pope required Galileo to renounce his views and write a detailed abjuration. He writes as follows:

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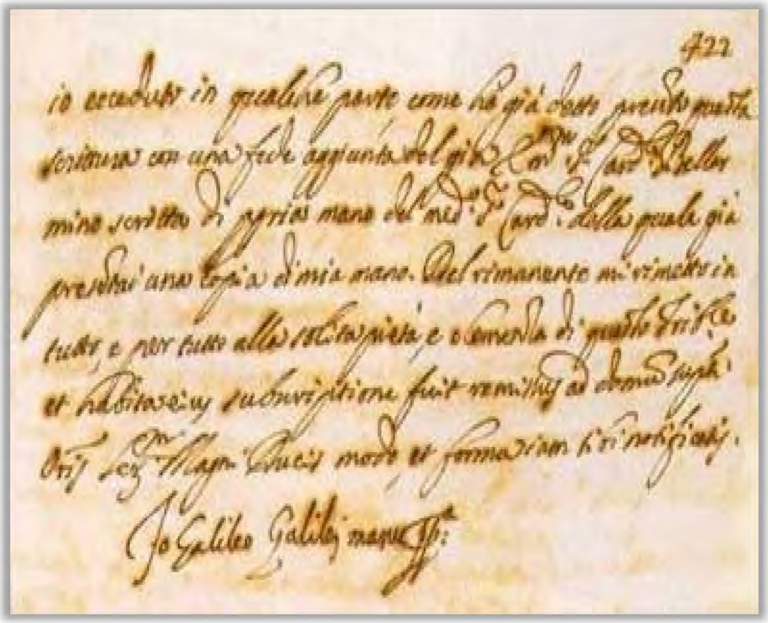
[599] As translated by Giorgio de Santillana in *The Crime of Galileo*, 1955, 1962, *Time*, Inc., pp. 332-336.

I, Galileo, son of the late Vincenzo Galilei, Florentine, aged seventy years, arraigned personally before this tribunal and kneeling before you, Most Eminent and Reverend Lord Cardinals Inquisitors-General against heretical pravity throughout the entire Christian commonwealth having before my eyes and touching with my hands the Holy Gospels, swear that I have always believed, do believe, and by God's help will in the future believe all that is held, preached, and taught by the Holy Catholic and Apostolic Church. But, whereas – after an injunction had been judicially intimated to me by this Holy Office to the effect that I must altogether abandon the false opinion that the sun is the center of the world and immovable and that the Earth is not the center of the world and moves and that I must not hold, defend, or teach in any way whatsoever, verbally or in writing, the said false doctrine, and after it had been notified to me that the said doctrine was contrary to Holy Scripture – I wrote and printed a book in which I discuss this new doctrine already condemned and adduce arguments of great cogency in its favor without presenting any solution of these, I have been pronounced by the Holy Office to be vehemently suspected of heresy, that is to say, of having held and believed that the sun is the center of the world and immovable and that the earth is not the center and moves:

Therefore, desiring to remove from the minds of your Eminences, and of all faithful Christians, this vehement suspicion justly conceived against me, with sincere heart and unfeigned faith I abjure, curse, and detest the aforesaid errors and heresies and generally every other error, heresy, and sect whatsoever contrary to the Holy Church, and I swear that in future I will never again say or assert, verbally or in writing, anything that might furnish occasion for a similar suspicion regarding me; but, should I know any heretic or person suspected of heresy, I will denounce him to this Holy Office or to the Inquisitor or Ordinary of the place where I may be. Further, I swear and promise to fulfill and observe in their integrity all penances that have been, or that shall be, imposed upon me by this Holy Office. And, in the event of my contravening (which God forbid!) any of these my promises and oaths, I submit myself to all the pains and penalties imposed and promulgated in the sacred canons and other constitutions, general and particular, against such delinquents. So help me God and these His Hoy Gospels, which I touch with my hands.

> I, the said Galileo Galilei, have abjured, sworn, promised, and bound myself as above; and in witness of the truth thereof I have with my own hand subscribed the present document of my abjuration and recited it word for word at Rome, in the convent of the Minerva, this twenty-second day of June, 1633. I, Galileo Galilei, have abjured as above with my own hand.[600]



An excerpt of Galileo's abjuration with his signature

Urban then sent a formal letter to the inquisitors and papal nuncios of Europe announcing Galileo's abjuration and requiring them to heed the Vatican's condemnation of Copernicanism.[601] One important fact that should not be missed in understanding the sternness of Urban's judgment against Galileo is that in 1616 when the pope was a cardinal (Maffeo Barberini), he had opposed the decree against Galileo that was issued under the aegis of Pope Paul V, and actually attempted to intervene on Galileo's side. In 1620, Barberini had written an ode in honor of Galileo titled *Adulatio Perniciosa* ("Perilous Adulation"). When he became pope in 1623, a year later he paid homage to Copernicus in an audience with Cardinal Hohenzollern remarking that heliocentrism would not be condemned as heretical, only as rash.[602] He lavished Galileo with favors, gave a pension for his son, as well as an expensive painting and medals of gold and silver. When in May 1630 Galileo came to Rome with his book titled *Dialogue on the Flux and Reflux of the Tides*, it was Urban VIII who suggested that he retitle the book *Dialogue on the Two Great World Systems*, although he had not read the book.[603] But Pope Urban, as we see in stark detail above, did a 180-degree turn against his former opinion. Not only was "rash" not chosen as a final judgment, in 1633 Urban revived the title of "heresy" against Copernicanism left over from the 1615 papal commission, and then added the adjective "formal" to specify its severity. Although from a human perspective there is a temptation to attribute Urban's change of mind to what some suspect was his understanding of being ridiculed as a simpleton in Galileo's *Dialogo*,[604] from a divine perspective it can safely be concluded that Urban, despite whatever vainglory with which his human character had been flawed, was being guided from above to answer one of the most serious threats the Church had ever faced.

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[600] *Ibid*., pp. 337-338. Also recorded in the original Italian and Latin in Favaro's*, Galileo e l'Inquisizione,* pp. 76-85; 142-151.

[601] Dorothy Stimson, *The Gradual Acceptance of the Copernican Theory of the Universe*, p. 59. Finocchiaro adds: "The Church's unprecedented effort to promulgate Galileo's sentence and abjuration is evidence of the attempt to generalize Galileo's case, to derive general prescriptions from his condemnation" (*Retrying Galileo*, p. 65).

Galileo Converts to Geocentrism

As we introduced Galileo's conversion to geocentrism in Chapter 1 (Volume 1), we will add excerpts of it here as we finish the story of Galileo.

Unbeknownst to almost every modern reader, and even most historians, is the fact that just one year prior to his death Galileo made it very clear to his former allies where he now stood on the subject of cosmology. On the 29th of March 1641, Galileo responded to a letter that he received from his colleague Francesco Rinuccini, dated the 23rd of March 1641, containing discoveries made by the astronomer Giovanni Pieroni concerning the parallax motion of certain stars, from which both Rinuccini and Pieroni believed they had uncovered proof of the heliocentric system. Rinuccini writes to Galileo:

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[602] Giorgio de Santillana, *The Crime of Galileo*, New York, *Time* Inc., 1962, p. 172.

[603] Koestler, *The Sleepwalkers*, p. 487.

[604] Finocchiaro has the best analysis of the possibility of such a sentiment in Urban VIII, but concludes that it may be just a myth because he has found no solid documentation for its existence (See *Retrying Galileo*, 1633-1992, pp. 185-188). Indeed, the running dialogue between September 1632 and June 1633, cited earlier, that Urban VIII had with the Duke of Tuscany's ambassador, Francesco Niccolini, clearly demonstrated that Urban's resolve was based solely on the biblical, theological and scientific inadequacies of Galileo's arguments.

> Your Illustrious Excellency, Signor Giovanni Pieroni has written to me in recent months telling how he had clearly observed with an optical instrument the movement of a few minutes or seconds in the fixed stars, but with just that level of certainty that the human eye can attain in observing a degree. All this afforded me the greatest pleasure - witnessing such a conclusive argument for the validity of the Copernican system! However, I have felt no little confusion because of something I read a few days ago in a bookshop. I happened to look at a book that is just now on the verge of being published. According to the author, if it were true that the sun is the center of the universe, and that the Earth travels around it once every year, it would follow that we would never be able to see half of the whole sky by night, because the line passing through the center and the horizons of the Earth, touching the periphery of the great orb, is a cord of a piece of the arc of the circle of the starry heavens, the diameter of which passes through the center of the sun. And since I have always believed it to be true - not having personally witnessed it - that the first [star] of Libra rises at the same moment as the first [star] of Aries sets, my limited intelligence has been unable to arrive at a solution. I therefore implore you, in your very great kindness, to remove this doubt from my mind. I will be very greatly obliged to you. Reverently kissing your hand, *etc*. Francesco Rinuccini."[605]

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[605] The original Italian reads: "Dal Sig^r Cap. Giovanni Pieroni mi fu scritto a' passati mesi [3960, 3966, 3980], come haveva chiaramente osservato con l'occhiale il moto nelle stelle fisse di alquanti minuti secondi, ma con tanta sicurezza quanta con l'occhio si saria potuto osservare un grado; che fu da me inteso con sommo gusto, per vedere così concludente argomento per la validatà del sistema Copernicano. Ma mi è vento non poco intorbidato dalla lettura che a questi giorni feci, in bottega di un libraro, casualmente di un libro che sta per uscire in luce, dove lessi che se fusse vero che il sole fusse nel centro e la terra gli girasse intorno per l'orbe magno nello spatio di un anno, seguirebbe che da noi non si vedrebbe mai la notte la metà del cielo, poichè la linea che passa per il centro e per gli orizzonti della terra, toccando la periferia dell'orbe magno, è una corda di un

Galileo, not being particularly moved by the assertions, writes this surprising response to Rinuccini:

> The falsity of the Copernican system should not in any way be called into question, above all, not by Catholics, since we have the unshakeable authority of the Sacred Scripture, interpreted by the most erudite theologians, whose consensus gives us certainty regarding the stability of the Earth, situated in the center, and the motion of the sun around the Earth. The conjectures employed by Copernicus and his followers in maintaining the contrary thesis are all sufficiently rebutted by that most solid argument deriving from the omnipotence of God. He is able to bring about in different ways, indeed, in an infinite number of ways, things that, according to our opinion and observation, appear to happen in one particular way. We should not seek to shorten the hand of God and boldly insist on something beyond the limits of our competence…. D'Arcetri, March 29, 1641. I am writing the enclosed letter to Rev. Fr. Fulgenzio, from whom I have heard no news lately. I entrust it to Your Excellency to kindly make sure he receives it.”[606]

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pezzo d'arco del cerchio del cielo stellato, il cui diametro passa, per il centro del sole. E perchè io ho sempre creduto che sia vero, non l'havendo visto per esperienza, che quando nasce il primo di Libra tramonti il primo di Ariete, non arrivo con la mia poca intelligenza a trovarne la solutione. Supplico dunque l'immensa sua gentilezza a rimuovere dalla mia mente questa dubitatione, che glie ne restero con soma obbligatione: e gli bacio reverentemente le mani. Venetia, 23 marzo 1641. Di V.S. molto Ill.^{re} et Ecc.^{ma} Aff.^{mo} et Obb.^{mo} Se.^{re} S.^{r} Galileo Galilei. Fran.^{co} Rinuccini” (*Le Opere Di Galileo Galilei*, Antonio Favaro, reprinted from the 1890-1909 edition by Firenze, G. Barbèra – Editore, 1968, vol. 18, p. 311, translated by Fr. Brian Harrison.

[606] The original Italian reads: “Ill.^{mo} Sig.^{r} et P.ron mio Col.^{mo}. La falsità del sistema Copernicano non deve essere in conto alcuno messa in dubbio, e massime da noi Cattolici, havendo la inregragabile autorità delle Scritture Sacre, interpretate da I maestri sommi in teologia, il concorde assenso de' quali ci rende certi della stabilità della terra, posta nel centro, e della mobilità del sole intorno ad essa. Le congetture poi per le quali il Copernico et altri suoi seguaci hanno profferito il contrario si levono tutte con quell saldissimo argumento preso dalla onnipotenza di Iddio, la quale potendo fare in diversi, anzi in infiniti, modi quallo che alla nostra oppinione e osservazione par fatto in un tal particolare, non doviamo volere abbreviare la mano di Dio, e tenacemente sostenere quello in che possiamo essere ingannati….D'Arcetri, li 29 Marzo 1641. Scrivo l'alligata al R. P. Fulgenzio, dal quale è un pezzo che non ho nuove, e la raccomando a V. S. per il sicuro ricapito” (*Le Opere Di Galileo Galilei*, 1968, vol. 18, p. 316). A note added by the editor states: “Bibl. Naz. Fir. Banco Rari, Armadio 9, Cartella 5, 33. –

Search as one might, few today will find Galileo's retraction of Copernicanism cited in books or articles written on the subject of his life and work.[607] Fewer still are those in public conversation about Galileo who have ever heard that he recanted his earlier view. The reason is, quite simply, that the letter has been obscured from the public's eye for the last four centuries. As Galileo historian Klaus Fischer has admitted: "The ruling historiographers of science cannot be freed from the reproach that they have read Galileo's writings too selectively."[608] Fortunately, Galileo's retraction managed to escape censorship and find its way among the rest of his letters in the twenty-volume compendium *Le Opere di Galileo Galilei* finally published in 1909 with a reprint in Florence in 1968. Centuries prior to its publication, there was a concerted effort by either Rinuccini or someone behind the scenes to cover up the fact that the letter was, indeed, written and sent by Galileo. We know this to be the case since a rather

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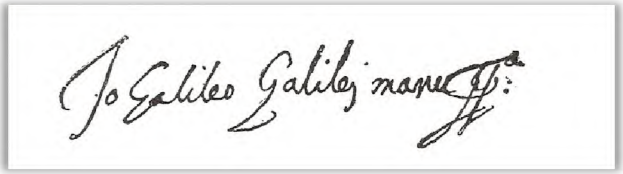
Originale, di mano di Vincenzio Vivani." This means that the letter is stored in the rare archives of the National Library at Florence in the rare books department, in cabinet #9, folder #5, 33 and written in the original hand of Vincenzio Viviani, since Galileo was blind in both eyes in 1641. Viviani was Galileo's last pupil and first biographer. NB: Viviani had performed the first Foucault-type pendulum experiment in 1661. Galileo's letter to Rinuccini was translated into English by Fr. Brian Harrison upon request. Stillman Drake contains a similar translation in *Galileo At Work: His Scientific Biography*, Chicago, London, The University of Chicago Press, 1978, p. 417.

[607] Even Maurice Finocchiaro, who is considered, and considers himself, one of the more thorough and detailed Galileo historians, fails to mention Galileo's conversion in any of his many books. In his latest book, *Retrying Galileo* (2005), Finocchiaro gives a comprehensive history of the Galileo affair from 1633 to 1992, concentrating in Chapter 3 on the years up to 1642, but makes no mention of Galileo's letter to Francesco Rinuccini concerning Pieroni's claim to discovering parallax, nor is Rinuccini's name included in the book's index. Rinuccini is only mentioned in passing on page 28. Finocchiaro is quite aware of Pieroni, however, since he mentions him on pages 67, 69: "…the efforts, activities and reports of Giovanni Pieroni. Born in Tuscany, he had studied with Galileo in Padua….In August 1635, Pieroni tried to convince Galileo to dedicate the *Two New Sciences* to Ladislaus…" On page 261, Finocchiaro makes reference to an apologetic article in *L'Osservatore Romano* of April 23, 1887, which stated: "You should believe Galileo himself, who, in the last years of his life, regretted having engaged in arbitrary interpretations of the Bible based on private judgment, which were especially dangerous at that time when this was the practice of the heretics in many parts of Europe." Rather than referring this to Galileo's 1642 conversion letter to Rinuccini, Finocchiaro says: "The last reference is unclear, but it probably referred to the Renieri apocryphal letter…" See also page 156 where Favaro agrees that the Renieri letter is apocryphal.

[608] Klaus Fischer, *Galileo Galilei*, Munich, Germany, Beck, 1983, p. 114.

obvious attempt was made to erase Galileo's name as the signatory of the letter. The compiler of the original letter makes this startling notation: "The **signature 'Galileo Galilei'** has been very deliberately and repeatedly rubbed over, with the manifest intention of rendering it illegible."[609]



Io Galileo Galilei mano ppa:

Stillman Drake, one of the top Galileo historians, noticed the subterfuge and commented:

> Among all Galileo's surviving letters, it is only this one on which his name at the end was scratched out heavily in ink. I presume that Rinuccini valued and preserved Galileo's letters no matter what they said, but did not want others to see this declaration by Galileo that the Copernican system was false, lest he be thought a hypocrite.[610]

Judging from the contents of his letter to Rinuccini, for quite some time it seems that Galileo had been contemplating the problems inherent in the Copernican system, as well as his desire to convert back to an Earth-centered cosmology. The wording in his letter is rather settled and direct, as it does not reflect someone who is confused or equivocating. It holds the convictions of a man who has been swept off his feet by a more convincing position.

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[609] *Le Opere Di Galileo Galilei*, p. 316, footnote #2, translated by Fr. Brian Harrison.

[610] *Galileo At Work: His Scientific Biography*, pp. 418-419. Drake adds: "Thanks to Galileo's own telescopic discoveries that was certainly true, while that astronomical instruments could not establish stellar parallax was not only true in his time but remained so for two centuries afterward." Although this is true, Drake is basing his defense on the mistaken notion that authentic measurements of stellar parallax would have proved the case for heliocentrism. It would not, since, as we saw in Volume I, stellar parallax is easily explained from a geocentric model of the universe, and which fact honest scientists readily admit. Of note here also is that in 1669 Robert Hooke, and John Flamsteed a few years afterward, attempted to prove the motion of the Earth by stellar parallax, yet both failed (John Flamsteed, *Historia Coelestis Britannica*, 1725, ed., Allan Chapman, trans., Alison D. Johnson, National Maritime Museum Monograph, No. 52, 1982, pp. 179-180). Hooke writes about this experience in his book: *An Attempt to Prove the Motion of the Earth by Observation*, London, 1674. It was also in this book that Hooke presented the Inverse Square Law of the force of gravity, thirteen years before Newton published the same law in his famous *Principia*.

So startling are Galileo's remarks that Drake attempts to soften their impact and do his best to rehabilitate Galileo as a heliocentrist. Commenting on the letter, Drake says:

> Galileo's reply to Rinuccini on 29 March may at first astonish the reader…. Yet there was nothing hypocritical in Galileo's saying that all science, including astronomy, is a fiction to the extent that it lies beyond the range of practicable observations; indeed, astronomy as Copernicus left it could not be reconciled with many actually observed facts known to Galileo…more important yet is Galileo's flat statement that the traditional geocentric astronomy was even more erroneous than the heliocentric.[611]

Here we see Drake implying that Galileo was denying Copernicanism merely because he saw both it and the Ptolemaic system as unable to explain the motions of the sun and planets. This is based on the part of Galileo's letter that says:

> And just as I deem inadequate the Copernican observations and conjectures, so I judge equally, and more, fallacious and erroneous those of Ptolemy, Aristotle, and their followers, when [even] without going beyond the bounds of human reasoning their inconclusiveness can be very easily discovered.[612]

But Galileo's wording is much more explicit than what Drake admits. Even if we were to grant to Drake that Galileo saw various problems in the Ptolemaic system, his letter to Rinuccini is clearly setting in opposition the entire "Copernican system" over against "the unshakeable authority of the Sacred Scripture, interpreted by the most erudite theologians, whose consensus gives us certainty regarding the stability of the Earth, situated in the center, and the motion of the sun around the Earth." These carefully chosen words are not, as Drake would have it, merely an attempt to point out the difficulties in the Copernican system prior to Kepler's discovery of the elliptical orbits of the planets. Rather, Galileo's words are identical to those of St. Robert Bellarmine stated some twenty-five years earlier, when the heliocentric system was first condemned under Pope Paul V and the Holy Office because it attempted to put the Earth in motion against the solemn words of Holy Scripture. Whereas in 1616 Galileo was arguing that Scripture should *not* be taken literally when it spoke on cosmology, now, in 1641, Scripture's literal interpretation is Galileo's hammer, just as it was for Bellarmine.

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[611] *Galileo At Work: His Scientific Biography*, pp. 418-419.

[612] Original Italian: "E come che io stimi insuffizienti le osservazioni e conietture Copernicane, altr'e tanto reputo più fallacy et erronee quelle di Tolomeo, di Aristotele e de'loro seguaci, mentre che, senza uscire de'termini de'discorsi humani, si può assai chiaramente scoprire la non concludenza di quelle" (*Le Opere Di Galileo Galilei*, vol. 18, p. 315).

That Galileo is renouncing the entire foundation of heliocentric cosmology is noted both in his unqualified acceptance of the "stability of the Earth, situated in the center, and the motion of the sun around the Earth," and his reference to "the conjectures of Copernicus *and other followers*," of whom Kepler, having been the first astronomer publicly to endorse Copernicus, was indeed one of his most ardent "followers," and one to whom Galileo was in correspondence on brief occasions. Not only is Galileo condemning Copernicanism by indicating that it is contrary to Scripture, he reinforces his line of reasoning by arguing that "the omnipotence of God" is "able to bring about in different ways, indeed, in an infinite number of ways" things we regard as improbable or impossible.

Galileo concludes his letter to Rinuccini by two other revealing statements. In the first, Galileo asserts that he can discredit the findings of Pieroni by an *a priori* assumption – that the Earth is in the center of the universe; and in the second, by renouncing his "unfortunate Dialogue" – the now famous book, titled more fully *The Dialogue Concerning the Two Chief World Systems* that Pope Urban VIII and the Sacred Congregation condemned in 1633 for its unqualified support of heliocentrism. He writes:

> And since you say you are perplexed and disturbed by [that is, in answering] the argument taken from our always seeing one-half the sky above the horizon from which it can be concluded with Ptolemy that the Earth is in the center of the stellar sphere…reply to the author [Pieroni] that truly one-half the sky is not seen, and deny this to him until he makes you certain that exactly half is seen – which he will never do. For whoever has said positively that half the sky is seen, and that therefore the Earth is established at the center, has it in his head to begin with that the Earth is established at the center, which is why he says that half the sky is seen – because that is what would have to happen if the Earth were at the center. So it is not from seeing half the sky that the Earth's being in the center is inferred [by

> these men], *but it is deduced from the assumption that the Earth is at the center that half the sky is seen…*[613]
>
> Now let us add that if the observations of Captain Pieroni be true about the motions of some fixed stars, made through a few seconds of arc, [then] small as these are, [this] implies to human reasoning changes by the Earth different from any that can be attributed to it [while] retained at the center. And if there is such a change, and it is observed to be less than one minute of arc, who wants to guarantee to me that when the first point of Aries rises, the first point of Libra sets so precisely that there is not even a difference to us of one minute of arc? Hence what should we want to deduce, in a very delicate and subtle observation, from experiences that are crass and even impossible to make? I might add other things on this subject, *but what was already said in my unfortunate* ***Dialogue*** *may suffice*.[614]

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[613] Translation by Stillman Drake, *Galileo At Work*, pp. 417-418, emphasis added. Original Italian without the ellipsis reads: "E poi che V. S. Ill. Dice restar perplessa e perturbata dall'argumento preso dal vedersi continumente la metà del cielo sopra l'orizonte, onde si possa con Tolomeo concludere la terra esser nel centro della sfera stellata, e non da esso lontana quanto è il semidiametro dell'orbe magno, risponda all'autore che è vero che non si vede la metà del cielo, e glie lo neghi sin che egli non la rende sicura che si vegga giustamente tal metà; il che non farà egli già mai. Et assolutamente chi ha detto, vedersi la metà del cielo, e però esser la terra collocata nel centro, ha prima nel suo cervello la terra stabilita nel centro, e quindi affermato vedersi la metà del cielo, perchè così doverebbe accadere quando la terra fusse nel centro; sì che non dal vedersi la metà del cielo si è inferito la terra esser nel centro, ma raccolto dalla supposizione che la terra sia nel centro, vedersi la metà del cielo" (*Le Opere Di Galileo Galilei*, vol. 18, p. 315).

[614] Translation by Stillman Drake, *Galileo At Work*, p. 418, emphasis added. Original Italian without the ellipsis reads: "Aggiunghiamo hora che sia vera la osservazione del Sig. Capitan Pieroni del moto di alcuna fissa, fatto con alcuni minuti secondi: per piccolo che egli sia, inferisce, a gli humani discorsi, mutazione nella terra diversa da ognuna che, ritenendola nel centro, potesse essergli attribuita. E se tal mutazione è, et si osserva esser meno di un minuto primo, chi vorrà assicurarmi se, nascendo il primo punto d'Ariete, tramonti il primo di Libra così puntualmente che non ci sia differenza nè anco di un minuto primo? Sono tali punti invisibili; gli orizonti, non così precisi in terra, nè anco tal volta in mare; strumenti astronomici ordinarii non possono essere così esquisiti che ci assicurino in cotali osservazioni dall'errore di un minuto; e finalmente, le refrazioni appresso all'orizonte posson fare alterazioni tali, che portion inganno non sol di uno, ma di molti e molti minuti, come questi medisimi osservatori concederanno. Adunque, che vogliamo raccorre in una delicatissima e sottilissima

The Faulty Analysis of Karl von Gebler

Hence, far from being a hero of modern cosmology, shortly before his death Galileo had become its worst adversary – a fact of history that has been either quietly ignored or deliberately suppressed. Of course, there are some who might refute this dramatic conversion of the former troublemaker by pointing out that Galileo was under house arrest beginning in 1633 by order of Pope Urban VIII. One might conjecture that, not wishing to agitate the pope, Galileo was merely speaking under duress and thus his words are not to be considered convincing evidence that he had abandoned his former views of cosmology. Although such a rationale is certainly possible, we get no hint of it in Galileo's carefully chosen words. Yet Galileo apologists often twist his words to make it appear as if Galileo was siding with heliocentrism. One of the more blatant attempts is

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osservazione da esperienze grosso lanissime et anco impossibili a farsi? Potrei soggiugner alter cose in questo proposito, ma il già detto nel mio Dialogo sfortunato dice tanto che può bastare" (*Le Opere Di Galileo Galilei*, pp. 315-316). The final paragraph appearing in *Le Opere Di Galileo Galilei* is: "Il Sig.^{r} Liceti debbe star rispondendo a quella mia lettera, la quale gli darà campo di portare nuovi et acutissimi pensieri; et il medesimo Sig.^{r} Liceti haverà comoda occasione di farsi sentire ancora ad un altro suo antagonista, coiè al nostro qua Sig.^{r} midico Nardi, il quale ha mandato nuovamente in luce un trattato de' fuochi sutterranei, al quale egli Annette cento problemi naturali con le loro resoluzioni. Vegga V.S. Ill.^{ma} il libro, et in particolare I problemi, che son tutti investigati dal proprio ingegno dell'autore; et in una lettura di poco più di un' ora vedrà la soluzione di tanti mirabili effetti della natura, che un solo mi ha messo in disperazione di intenderlo con la contemplazione del tempo di tutta mia vita. Nè mi occorrendo altro per ora, finisco con augurargli felice questa Santa Pasqua, con confermarmegli devotissimo servitore." The following is its translation: "Signor Liceti should be responding to that letter of mine, which will afford him the opportunity to contribute new and very penetrating ideas. And the same Signor Liceti will thus have a convenient occasion to get his message through once again to another of his opponents, namely, our medical friend Signor Nardi. The latter has just published another treatise on the fires beneath the Earth's surface, this time with an Addendum setting out one hundred problems of natural science, together with their solutions. I warmly recommend that Your Excellency look at this book, especially the aforesaid problems, all of which the author has investigated personally, and with great skill. In a little over an hour's reading you will see the explanation of a great number of marvelous natural phenomena. Just one of these had been the object of my own studies over a lifetime, but I had despaired of ever being able to understand it. Since I have nothing more to add at this moment, I will end by wishing you a happy and holy Easter. While assuring you that I remain, Your most devoted servant, Galileo Galilei" (Translation by Fr. Brian Harrison).

constructed by Karl Von Gebler in the 1879 book *Galileo Galilei and the Roman Curia*. After quoting a bit of Galileo's letter to Rinuccini, Gebler focuses on one particular paragraph, which states: "And as I hold the Copernican observations and conclusions to be insufficient, those of Ptolemy, Aristotle, and their followers appear to me *far more delusive and mistaken, because their falsity can clearly be proved without going beyond the limits of knowledge*."[615] After italicizing the above words, Gebler proceeds to redact Galileo's meaning:

> After this introduction Galileo proceeds to answer Rinuccini's question. He treats that argument against the Copernican system as delusive, and says that it originates in the assumption that the earth stands still in the centre, and by no means from precise astronomical observation.[616]

One wonders what kind of tea Gebler was sipping at the time since Galileo does not say that arguments against the Copernican system are delusive, but only that the particular arguments of Aristotle and Ptolemy are delusive, and indeed they are. Obviously, since Galileo already stated earlier in his letter that

> The falsity of the Copernican system should not in any way be called into question…interpreted by the most erudite theologians, whose consensus gives us certainty regarding the stability of the Earth, situated in the center, and the motion of the sun around the Earth. The conjectures employed by Copernicus…are all sufficiently rebutted by that most solid argument deriving from the omnipotence of God,

then Galileo could not later restore credence to the Copernican theory. Hence, Gebler's conclusion, which is, "He refutes, therefore, the scientific objection ot the new doctrine" and "Speaking of the assumed discovery of

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[615] Karl von Gebler, Galileo Galilei and the Roman Curia, 1879, p. 304. Our translation is similar: "And just as I deem inadequate the Copernican observations and conjectures, so I judge equally, and more, fallacious and erroneous those of Ptolemy, Aristotle, and their followers, when [even] without going beyond the bounds of human reasoning their inconclusiveness can be very easily discovered." (Original Italian: "E come che io stimi insuffizienti le osservazioni e conietture Copernicane, altr'e tanto reputo più fallacy et erronee quelle di Tolomeo, di Aristotele e de'loro seguaci, mentre che, senza uscire de'termini de'discorsi humani, si può assai chiaramente scoprire la non concludenza di quelle" (*Le Opere Di Galileo Galilei*, vol. 18, p. 315).

[616] Gebler, p. 304.

Pieroni, he says, that if it should be confirmed, however small the parallax may be, human science must draw the conclusion from it that the earth cannot be stationary in the centre,"[617] is equally erroneous. Galileo mentions nothing about parallax proving the Copernican theory. Gebler, like many other Galileo apologists, put words into the mouth of Galileo that are simply non-existent.

Galileo is simply saying that he doesn't think anyone has provided the true model of the heavenly movements, whether it be Aristotle, Ptolemy or Copernicus, and he is indeed correct. Aristotle used perfect circles for the orbits of the planets as well as crystalline spheres. Copernicus used the same faulty model, and therefore he never produced a workable system. Ptolemy had the wrong distances to the planets and thus he could never get the phases of Venus to appear correctly, and Galileo was the discoverer of the phases of Venus. Hence, all Galileo is saying by the words "I hold the Copernican observations and conclusions to be insufficient, those of Ptolemy, Aristotle, and their followers appear to me far more delusive and mistaken" is that no model up to his time captured the precise movements of the planets, and he was certainly correct. For that matter, neither Tycho's or Kepler's models give precise movements of the planets, since Fourier analysis shows that, because of the perturbations of the planets, we can only approximate their movements.

In the end, Gebler has led us to the unmistakable conclusion that Galileo's letter to Rinuccini is indisputably authentic and not written under duress. For Galileo to say, quite boldly and still under house arrest, that both the Copernican and Ptolemaic systems were inadequate means that he was abiding by his scientific commitments while at the same time allowing the "omnipotence of God" to determine the true system that put the earth in the center and kept it motionless. Indeed, only the mind of God could put all the pieces together and make a coherent system that ticks like a Rolex watch.

Stillman Drake certainly didn't see Galileo's letter the way Gebler saw it, since he interprets it with all the seriousness with which he assumes Galileo wrote it. Being the proud man Galileo was known to be, if his motive was merely to keep peace with the pope and preserve his fortunes, a simple and polite denial to Rinuccini's claims was all that was necessary. Instead, Galileo is defending the immobility of the Earth with such an exuberance of spirit and logic that he appears to be the epitome of a man who has had his 'eureka' moment and will not be denied. Charlatans have few convictions; those under duress guard their words and often equivocate; politicians tend to play favorites and say what will bring them popularity; but Galileo exhibits none of these vices in his letter. He takes sides with no one; rather, he equally condemns Ptolemy, Copernicus and Kepler, for he realizes that none of them have answered all that he has seen in his telescope, and only God Himself knows how it fits together.[618] Hence, he rests his case not with *any* scientific theory but with the "omnipotence of God," Who merely speaks and all is accomplished. In fact, Rinuccini, after reading Galileo's letter, was so thoroughly convinced of its sincerity that it became the very reason he attempted to scratch Galileo's signature off what he knew would change the course of history had it been revealed to the public.

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[617] *Ibid.*, p. 305.

Where might Galileo have heard the persuasive "omnipotence of God" line of argumentation? It most likely came from Pope Urban VIII in 1633. Scientifically speaking, by this time Urban was already armed with Tycho de Brahe's alternative model of cosmology, which was presented to the world a half century earlier and which graphically demonstrated how easy it is to envision the sun and planets circling the Earth while adhering to all the proportions and motions that were in Galileo's heliocentric model.[619] Knowing this, Urban could then speak quite confidently from both a scientific and theological perspective, and thus assure Galileo that not only was the weight of the evidence against him, but in refusing to accept the Church's verdict he would then find himself contending with the Almighty. In the pope's words to Galileo:

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[618] Here Galileo shows reflections of his earlier views recorded in *The Assayer*, published in 1623. As Feyerabend notes: "Replying to an adversary who had raised the issue of Copernicanism he remarks that 'neither Tycho, nor other astronomers nor even Copernicus could clearly refute [Ptolemy] inasmuch as a most important argument taken from the movement of Mars and Venus stood always in their way.' …. He concludes that 'the two systems' [the Copernican and the Ptolemaic] are 'surely false' …. He emphasizes that not only Ptolemy, but Copernicus as well, is refuted by the facts…" (*Against Method*, p. 80). Imre Lakatos adds: "One can hardly claim that Copernicus deduced his heliocentrism from the facts. Indeed, now it is acknowledged that both Ptolemy's and Copernicus's theories were inconsistent with known observational results" (*The Methodology of Scientific Research Programmes*, p. 170). Lakatos adds a comment from Gingerich: "'…in Tycho's observation books, we can see occasional examples where the older scheme based on the Alfonsine Tables yielded better predictions than could be obtained from the Copernican Prutenic Tables'" ("The Copernican Celebration," *Science Year*, 1973, pp. 266-267).

[619] Galileo was well aware of the influence Tycho's model had on his contemporaries. In his 1624 letter to Francesco Ingoli, Galileo complains several times about "Tycho's authority" to which Ingoli and many others were siding (see Finocchiaro's *The Galileo Affair*, pp. 170, 174, 175). In 1612, Christoforo Borro, known as the "Doctor of Mathematical Sciences," published *De astrologia universa tractatus*, which asserted the Tychonic model over the Ptolemaic and Copernican models. As it was, the Jesuits were beginning to side with the Tychonic model at least twenty years before Galileo made known his telescopic evidence in his 1610 book *Siderius nuncius*. As Ernan McMullin notes: "It seems likely, then, that the availability of the Tychonic alternative played a modest role, at least, in the assurance with which Rome issued its ban on the Copernican

> Let Us remind you of something that We had occasion to tell you many years ago, speaking as one philosopher to another; and, if We remember, you were not willing then to offer Us any definite refutation.
>
> Let Us grant you that all of your demonstrations are sound and that it is entirely possible for things to stand as you say. But now tell Us, do you really maintain that God could not have wished or known how to move the heavens and the stars in some other way? We suppose you will say 'Yes,' because We do not see how you could answer otherwise. Very well then, if you still want to save your contention, you would have to prove to Us that, if the heavenly movements took place in another manner than the one you suggest, it would imply a logical contradiction at some point, since God in His infinite power can do anything that does not imply a contradiction. Are you prepared to prove as much? No? Then you will have to concede to Us that God can, conceivably, have arranged things in an entirely different manner, while yet bringing about the effects that we see. And if this possibility exists, which might still preserve in their literal truth the sayings of Scripture, it is not for us mortals to try to force those holy words to mean what to Us, from here, may appear to be the situation.
>
> Have you got anything to object? We are glad to see that you are of Our opinion. Indeed, as a good Catholic, how could you hold

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propositions, foreseeing no danger in consequence that the evidence from astronomy could call that ban into question at a later time….they could have responded that all of the evidence from planetary motions that told for the Copernican cosmology could be handled equally well by the Tychonic alternative….Such, for example, was Christopher Scheiner, perhaps the most accomplished Jesuit astronomer of his generation. The availability of the Tychonic alternative was decisive for him" (*The Church and Galileo*, pp. 164-165). In a similar way, the Tychonic model probably influenced Cardinal Robert Bellarmine, Galileo's chief antagonist. In a letter to Federico Cesi on August 25, 1618 Bellarmine writes: "Thus it is possible for us to select among them the one which best corresponds to the Sacred Scriptures" (Richard Blackwell, *Galileo, Bellarmine and the Bible*, p. 42).

> any other? To speak otherwise than hypothetically on the subject would be tantamount to constraining the infinite power and wisdom of God within the limits of your personal ideas [*fantasie particolari*]. You cannot say that this is the only way God could have brought it about, because there may be many, and perchance infinite, ways that He could have thought of and which are inaccessible to our limited minds. We trust you see now what We meant by telling you to leave the theology alone.[620]

Additionally, Galileo's appeal to the "omnipotence of God" against the claims of Rinuccini was not being used in the same sense that he had ridiculed it in his *Dialogo*. In the *Dialogo*, which he had begun writing between 1621-1623 and was thus far removed from the controversy of 1633, Galileo attempted to confuse the issue by equating omnipotence with the miraculous. He writes:

> Surely, God could have caused birds to fly with their bones made of solid gold, with their veins full of quicksilver, with their flesh heavier than lead, and with wings exceedingly small. He did not, and that ought to show something. It is only in order to shield your ignorance that you put the Lord at every turn to the refuge of a miracle.[621]

Now, of course, in 1641, he saw things differently. God could make the Earth the central and immobile dot in the universe by natural means, not miraculous, for He, by his omnipotence, would know very easily how to accomplish such a task.[622]

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[620] Giorgio de Santillana, *The Crime of Galileo*, New York, *Time* Inc., 1962, pp. 175-176. Santillana adds: "Historians usually date this idea from the conversation of 1630. But we have seen (p. 135) that it is mentioned in Oregius' *Praeludium*, whence we have paraphrased the statement quoted below. The passage in question, according to Berti, occurs also in the first edition of 1629. Hence the argument dates back at least to 1624 and probably, as Oregius implies, was used for the first time in 1616."

[621] Giorgio de Santillana, *The Crime of Galileo*, 1962, p. 176.

[622] In 1641 Galileo's 1632 book *Dialogo sopra i due massimi sistemi del mundo* (*Dialogue on the Two Chief World Systems*), which was originally written in Italian, was republished in Latin in Lyons, France and retitled *Systema Cosmicum: in quo Dialogis*. It was then republished in London in 1663 under the title *Diologus de Systemate Mundi*. Except for his 1632 version, Galileo had nothing to do with these later publications, although some authors erroneously assert that Galileo published the 1641 edition. Not only did Galileo convert to geocentrism,

Galileo's Conversion to the True Catholic Faith

The question arises whether it was merely a scientific conviction that led Galileo to change his mind toward geocentrism or was something more serious and personal involved. We get a strong indication of the latter from the research of David Wootton in the 2010 book, *Galileo: Watcher of the Skies*. Similar to the biography we have assembled in our book, Wootton is not shy about painting the darker side of Galileo's life. For example, after remarking on how badly Galileo treated two of the three children he fathered with Marina Gamba, Wootton gives substantial evidence that Galileo fathered a fourth child out of wedlock around 1610. Her name was Anna from her mother's Cassandra, although nothing further about the latter is forthcoming. Benedetto (which is also the same name of Galileo's best friend, Benedetto Castelli) was the son of Anna and who "was, it seems, the spitting image ('il vero ritratto')" of Galileo.[623] Wootton also tells us about the affair between Galileo and Alessandra Buonamici who was married to a bed-ridden husband and wished to leave him for Galileo but which circumstances did not allow.[624] Wootton also reveals how Galileo blatantly plagiarized the work of Scheiner regarding the movement of sunspots, which Galileo then used to argue that the Tychonic geocentric system required the sun to change its angle of orientation, something not required of the Copernican heliocentric system.[625] This data on sunspots was quickly added to the *Dialogo*, almost word-for-word from Scheiner's manuscript.

As Wootton adds up all the sordid details of Galileo's life, he comes to the conclusion that Galileo was not a true Catholic at all. In a chapter titled "Galileo's (un)belief," Wootton pulls no punches in saying that "If agreeing with the fundamental teachings of the Church is what counts, then neither Galileo nor Mme de Warens was a Catholic at all….These three types of evidence establish, I think, a very strong presumption that

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he was under the edict of Pope Urban VIII until his death the next year in 1642. The French and English publishers were known for circumventing the *Index of Forbidden Books*, but Galileo's *Dialogo* remained on the Index until 1835. Finocchiaro adds: "Protestants and progressive and liberal-minded Catholics came to Galileo's defense and started using his arguments and image in the struggle for individual freedom….Practitioners of astronomy, mathematics, and natural philosophy became polarized into pro-Galilean and anti-Galilean camps…" (*Retrying Galileo*, p. 85).

[623] *Galileo: Watcher of the Skies*, p. 185, with Wootton's reference taken from Favaro's *Scampoli galileiani*, ii, 460-5.

[624] *Ibid*., p. 201f.

[625] *Ibid*., p. 208f.

Galileo was not a Christian, nevertheless they are not conclusive,"[626] and then, "In later work, Redondi has made clear that he shares the general consensus that Galileo was a believing Christian, if not an orthodox one. This consensus, in my view, is simply mistaken."[627] Wootton then reveals the likely motivation for Redondi's sentiment:

> In the case of Galileo, where generations of scholars, particularly liberal Catholic scholars, have wanted to portray him as an innocent victim, whose genuine faith ought to have been a protection against any condemnation for heresy, there is now an enormous cultural investment in the idea of him as a good Catholic. Vivani was remarkably successful in establishing an account of Galileo's commitment to Catholicism which has survived largely unchallenged for more than three centuries.[628]

Elaborating on this theme, Wootton writes:

> Urban VIII regarded the argument of the *Dialogue* as not only disloyal but impious. Here, as elsewhere, his judgment was sound. Galileo always acknowledged the authority of the Church, and always claimed to be a pious Catholic. But a distinction needs to be drawn between his official position and his private convictions. In the twenty volumes of his works there is a very striking absence of evidence suggesting any private piety. Reading his letters, there is no sign—or almost no sign—of his saying his prayers, listening to sermons, or reading either the Scriptures or the fathers of the Church. There is no indication that he believed in sin, contrition and redemption. He avoids all mention of Jesus. Galileo was no Christian: we can see well enough behind the public persona to be fairly sure of this, and we have the confirmatory testimony of Castelli.

Portraying Galileo more like a medieval Carl Sagan, Wootton adds:

> Galileo's Copernicanism, his scientific method and his unbelief were, indeed, mutually supporting: all three represented a rejection of the traditional view that the world was made for man, and that man was made in the image of God. Rather, Galileo argued, we need to recognize that the world is

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[626] *Ibid.*, p. 241.
[627] *Ibid.*, p. 264.
[628] *Ibid.*, p. 241.

> profoundly imperfect, that we can understand only fragments of it, and that humankind appears irrelevant to its purposes, supposing it has any. Galileo sought to live with the idea that we do not know what the universe if for, even though certain aspects of it suggest that it was designed for a purpose.[629]
>
> Galileo sought to escape from a world in which his mother loomed too large by discovering the insignificance of humankind: far from being at the center of a universe built especially for them, human beings were insignificant creatures within the vast expanses of an inhuman cosmos.[630]
>
> Indeed he offered a view of the cosmos in which humankind, and the things that matter to humankind—love and hatred, virtue and vice, mortality and immortality, salvation and damnation—were irrelevant. Far from embodying a scheme of values, far from embodying a *telos* or purpose, Galileo's universe appeared to be indifferent to moral and metaphysical issues, and even indifferent to our own existence. It is not hard to sympathize with those who recoiled from this new vision.[631]
>
> Above all, there is no evidence prior to 1639 that Galileo believed that Christ died to save our souls from damnation.[632]

As we will see with many scientists who lead a life of sin (*e.g.*, Albert Einstein), they attempt by means of science to eliminate God from the picture. Often they are driven by a subconscious need to relieve their guilt. Pretending God doesn't exist is one such way to do so. Wootton then says:

> …Galileo's central but unspoken claim was that if one had a proper idea of nature then one could dispense with the Christian idea of an omnipotent, providential God who had created the universe and would judge the souls of men and replace it, on the one hand, with a Platonic idea of God as the Supreme Mathematician, indifferent to the affairs of men, and on the other hand, with nature as the *anima mundi*.[633]

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[629] *Ibid.*, pp. 264-265.

[630] *Ibid.*, p. 253.

[631] *Ibid.*, pp. 257-258.

[632] *Ibid.*, p. 249.

[633] *Ibid.*, p. 247. Wootton adds: "The letter to Dini is the only occasion in his correspondence in which Galileo gives expression to his esoteric religious

> …Galileo's view of movement is compatible with the idea of an eternal universe, and that if the universe is eternal, one can dismiss all arguments from the first cause or the first mover, get rid of God and become an atheist.[634]

Wootton concludes:

> My account of Galileo in this book has been novel in three significant respects: I have emphasized his early Copernicanism, his reluctant empiricism and his private irreligion. I have also stressed his extraordinary intellectual ambition, his enormous vanity and his capacity for self-destruction: Galileo was no secular saint, although he was capable of pretending that he was.[635]

But that was then, and this is now. As Wootton makes a strong case that Galileo was as unchristian as Koestler said, he also reveals a stunning reversal in Galileo's life – that he became a true Catholic around 1639, three years before his death. This event, of course, would explain why Galileo told Rinuccini in 1641 that he no longer accepted the Copernican system and now believed that God could easily make the universe with the Earth motionless in the center. It was on June 7, 1639 that…

> Benedetto Castelli, Galileo's old friend, former pupil and long-time intellectual companion, wrote to him from Rome. They had known each other for at least thirty years. They were so close that in 1620 Cavalieri had assumed that anything written to one of them would be known by the other. Each had reason to trust the other completely. And in questions concerning the religion of Galileo we can trust Castelli…[636]
>
> Castelli has heard news of Galileo tht has made him weep with joy, for he has heard that Galileo has given his soul to Christ. Castelli immediately refers to the parable of the laborers in the vineyard….he turns to the crucifixion, and in particular to the two thieves crucified on either side of Christ.

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teaching, and of course it comes with an urgent request: 'I beg you not to let it come into the hands of any person who would use the hard and sharp tooth of a beast…and so would completely mangel and tear it to pieces.'"

[634] *Ibid.*, p. 248.

[635] *Ibid.*, p. 265.

[636] *Ibid.*, p. 247.

> Castelli's invocation of the parable…and two thieves…is clear and unambiguous. He believes Galileo is coming to Christianity at the last moment, but not too late to save his soul. There is no conceivable interpretation of this letter which is compatible with the generally held view that Galileo was, throughout his career, a believing Catholic. It will not do, for example, to suggest that Galileo had previously been a believer, but had been lax in the practice of his religion.
>
> Castelli allows himself to discuss Galileo's unbelief only because he has been given to understand that he is now, at long last, a believer. There are no further letters like this one….Castelli's letter cannot tell us what really happened to Galileo in May 1639; but what is clear is what Castelli had always understood about his close friend: that he was no believer. And if anyone was in a position to know if Galileo was or was not a believer it was Castelli.[637]

As Wootton noted earlier that, "liberal Catholic scholars have wanted to portray him [Galileo] as an innocent victim" and have an "enormous investment in the idea of him as a good Catholic," and "accept without question the claims made on behalf of modern science," one of Wootton's final comments is apropos: "Rethinking Galileo's (un)belief is an important step towards re-examining current orthodoxies regarding the intellectual and cultural origins of the scientific revolution."[638] Since the time of Copernicus, modern scientists have been on a quest to eliminate God from the cosmos and turn it into a self-existent and self-perpetuating machine. The main reason, as we have seen, is to rid themselves of the guilt of their sin.

In the end, although we are grateful to Wootton for taking a stand against the rosey picture of Galileo foisted on the public for the last three centuries, his book does not contain the account of Galileo's stated rejection of Copernicanism in 1641, which seems odd considering Wootton is the first to reveal Galileo's conversion to true Catholicism. We don't know the reason for Wootton's omission here, but it may have something to do with the fact that he still believes stellar parallax was when "the movement of the earth was first reliably demonstrated," and that the Foucault Pendulum "allows one directly to see the earth moving."[639]

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[637] *Ibid.*, pp. 247-248.

[638] *Ibid.*, p. 250.

[639] *Ibid.*, p. 262.

Pope Alexander VII's 1664 *Index of Forbidden Books*

Thirty-one years after Pope Urban VIII and his Sacred Congregation of the Index condemned heliocentrism as "formally heretical" and "erroneous in faith," on March 5, 1664, Pope Alexander VII attached condemnations of the works of Copernicus, Galileo, and Kepler to a papal bull appropriately titled *Speculatores domus Israel* ("Watchman over the House of Israel"), signed by the pope himself and which declared that the *Index of Forbidden Books* was part of the papal bull and thus bore his direct papal authority.[640] In this way, the pope's decree against books teaching heliocentrism was in the *forma specifica* venue, one of the highest magisterial vehicles for the dissemination of papal authority. The pope also mentions past decrees against heliocentrism, which implies that the decree of 1633, which stated that heliocentrism was "formally heretical" and "erroneous in faith," were personally and canonically confirmed by Alexander VII. Needless to say, this highly authoritative bull was the chosen means the pope determined to be a "Watchman" for the Church, to protect it from heretical and erroneous ideas that would damage the faith of its people. Below is an English translation of the papal bull, *Speculatores Domus Israel*, with important parts underlined for emphasis:

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[640] ¶6: "All these things were ordered to be carried out carefully and accurately according to Our mind, and the resulting general Index, including all the Tridentine and Clementine documentation, has now been composed. By Our order, it has also been revised and printed at the press of Our apostolic household, with the insertion of this present Bull. Therefore, on the advice of the aforesaid cardinals, We, by Our apostolic authority, and by means of this present Bull, confirm and approve the said general Index, with each and every thing contained in it." *Index Librorum Prohibitorum et Expurgandorum Novissimus, Pro Catholicis Hispaniarum*, Regnis Philippi IV, Regis Cathol., Ill., AC. R. D.D. Antonii A Sotomaior O.P., Supremi Præsidis, & in Regnis Hispaniarum, Siciliæ, & Indiarum Generalis Inquisitoris, c. jussu ac studiis, luculenter & vigilantissimè recognitus, Madriti [Madrid], Ex Typographæo Didaci Diaz, Subsignatum Lldo Huerta, M. DC. LXVII [1667]. "*Index Librorum Prohibitorum*, Alexandri Septimi [Alexander VII] Pontificis Maximi jussu editus: Copernicanæ Astrologiæ Epitome. *vide*, Ioannis Kepleri; Copernicus. *vide*, Nicolaus." (p. 30); "Galileo Galilei. *Vide*, Dialogo di Galileo." (p. 52); "Ioannis Keppleri Epitome Astronomiæ Copernicanæ" (p. 73), attached to: "…Bullam Alexandri VII, P. M. qualis est in limine Editonis Superioris Anni, qui est M, DC, LXIV [1664]. Nam licèt nonnulla contineat, quæ ad illam Editionem, ejusque dispositionem speciatim pertinent, non sufficiebat tamen ea ratio, vt ejus lectione non fruerentur hic Fideles. Alexander Papa VII, Ad perpetuam rei Memoriam. Speculatores Domus Israel…" (p. 137).

Alexander VII's Bull: *Speculatores Domus Israel*

Having been constituted, in the mysterious designs of divine Providence, as watchman over the house of Israel, that is, the holy Church of God, We continually strive with particular zeal to exercise Our pastoral vigilance by alerting the Lord's flock to imminent dangers, so that the sheep redeemed by the precious blood of our Lord and Savior Jesus Christ shall not be seduced from the path of truth, but rather, may continue their happy journey toward the goal of eternal blessedness by persevering in that path under the guidance of salutary doctrine.

1.Thus, it is of very great importance in the governance of the Church to teach sound morality and to condemn false doctrines; for the former activity promotes upright conduct, while the latter enables the pure light of faith to shine forth. The Apostolic See, therefore, realizing clearly that reading is an excellent way for men to learn what they should believe and how they should behave, exercises – as it has always exercised – a particularly alert vigilance in laying down norms for the reading of books. For by means of these norms – designating by name authors and writings which faithful Christians should abstain from reading – discernment is effected between good and evil literature, that is, between harmless and harmful books.

2. In this matter, Our venerable brethren the cardinals of the Holy Roman Church who have been appointed to supervise the Index of books deserving prohibition (in whole or in part), have been devoting their attention – not only by their own will and initiative, but also in attentive obedience to Our own special command – to the following problem. After Our predecessor of happy memory Pope Clement VIII promulgated an Index of forbidden books that followed the form of the earlier Index ordered by the holy Council of Trent, many more books were prohibited, and their authors condemned, both by the Roman Pontiffs who succeeded the said Pope Clement and by their congregation of cardinals. Nevertheless, there has been no officially compiled and published catalog setting out in a clear and well-ordered manner *all* these prohibited books and condemned authors, with the result that great confusion has arisen regarding this matter – confusion that will only keep increasing in the future unless opportune provisions are made.

3. Therefore, desirous of confronting the difficult task of finding a true solution, and after mature and diligent deliberation which has involved a number of the aforesaid cardinals who were designated to deal with this problem more effectively, We have decreed, firstly, that they undertake to compose a new Index including not only those books that have been prohibited (or otherwise censured) *after* the promulgation of the most recent Index by Our predecessor Clement, but also those contained in his own list and the earlier one. Secondly, as regards the method of ordering the names of authors and subjects, We have decided that a simple list in alphabetical order will henceforth be used instead of the previous threefold system of classification. Although that original system had features that were initially praiseworthy, experience has shown that a simpler format, unencumbered with additional annotations – many of them becoming less relevant over the course of time – will be more convenient. Readers will now be able to find any given author in the Index without difficulty, and this will be of special benefit to booksellers. It is in the public interest that they, above all, have at their disposition an Index that is clear and easy to use; for a mistake on their part may well cause many others to fall into error.

4. As things turned out, the system used previously for distinguishing the various categories of books often proved deceptive for many readers – learned as well as simple. For they thought the order in which the books were condemned corresponded to the degree of gravity – as if persons reading books listed in the first pages of the Index would always incur more severe sanctions than those who might read the books appearing further down the list. Actually, it can easily be inferred from the Council of Trent's system of classification that this is not the case. For what it gave precedence to was only the distinction between books condemned on account of the vices and defects of their authors and those reprobated because of the pernicious doctrine and errors they contained. This was followed by distinguishing books that give the author's own name from those published under a pseudonym. So it has happened that many books, placed in this third and last category solely because their authors were unknown, are much worse than some others mentioned in the first and second categories. Hence, We have decided to eliminate completely this source of confusion, lest it become the occasion of dangerous laxity in these matters.

5. While ordering this previous system of classification to be discontinued, We have decided, nevertheless, that some acknowledgment of it should still be retained. Hence, in the censure of each book, the aforesaid earlier classifications and annotations (wherever these exist) will be cited, along with the decrees by which the books were originally censured. In this way the case history of each censured book will be made known.

6. For the same reason, We have seen to it that the Tridentine and Clementine Indices, together with their appendices, have been reproduced in this new general Index, along with all relevant decrees promulgated up till now since the publication of our predecessor Clement's Index. In this way, nothing that might be useful in satisfying the investigative zeal of even the most studious Catholic reader could seem to have been omitted. All these things were ordered to be carried out carefully and accurately according to Our mind, and the resulting general Index, including all the Tridentine and Clementine documentation, has now been composed. **By Our order, it has also been revised and printed at the press of Our apostolic household, with the insertion of this present Bull**. Therefore, on the advice of the aforesaid cardinals, We, by Our apostolic authority, and by means of this present Bull, confirm and approve the said general Index, with each and every thing contained in it. Furthermore, We command and admonish all persons residing in whatever place, collectively and individually, to observe its prescriptions inviolably and unswervingly, under pain of incurring the penalties contained in the Constitution published by order of our predecessor of happy memory Pope Pius IV in regard to the aforesaid Tridentine Index.[641] And in order to do away with the variations found in older decrees laying down penalties for transgressors, We also restore by the present Bull each and every one of the penalties inflicted in any form whatsoever by previous apostolic constitutions and other documents dealing with these matters – without prejudice, however, to those prescriptions regarding condemned books and authors which are customarily published each year on Holy Thursday in an

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[641] From "All these things" to "aforesaid Tridentine Index" the Latin is: Quae omnia, cum iuxta mentim nostram diligenter et accurate fuerint exequutioni mandata, composito Indice generali huiusmodi, dui etiam regulae Indicis Tridentini, cum observationibus et instructione memorato Indici Clementino adiectis appositae fuerunt: nos, de praedictorum cardinalium consilio eumdem Indicem generalem, sicut praemittitur, iussu nostro compositum atque revisum, et typis camerae nostrae apostolicae iam impressum, et quem praesentibus nostris pro inserto haberi volumes, cum omnibus et singulis in eo contentis, auctoritate apostolicâ, tenore praesentium, confirmamus et approbamus, ac ab omnibus tam universalibus quam singularibus personis, ubicumque locorum existentibus, inviolabiliter et inconcusse observari mandamus et praecipimus, subpoenas in constitutione recolendae memoriae Pii Pappae IV etiam praedecessoris nostri super dicti Indicis Tridentini confirmatione editâ contentis.

Apostolic Letter. These prescriptions We do not intend to change, or even discuss, in any way at all.

7. Consequently, We command each and every one of our venerable brethren, the patriarchs, archbishops, bishops and other Ordinaries of places, as well as those beloved sons who are their vicars and officials, the inquisitors of heretical depravity, the superiors of every kind of religious Order, congregation, society, or institute, and all others who are, or will be in future, in any way concerned, to do all in their power to see that this general Index is made widely available and observed. Let them be mindful that the office committed to them involves the duty of both keeping the sheep of the Lord's flock away from poisonous pastures, and filling them with nourishing food. God forbid that any of these shepherds, through malice or negligence, should cease to fulfill this duty! For then they will find themselves obliged to give an account, before a severe Judge, for all the enormous and very grave evils that inevitably arise from their failure.

8. Notwithstanding anything contrary to the above: that is, any constitutions or edicts – whether apostolic or published by general, provincial or synodal councils in either general or special form – and regardless of any apostolic confirmation or other kind of backing, even by an oath, of any statutes, customs or privileges, indults and apostolic letters, in any shape or form or with any kind of clauses or decrees, that may have been in any way conceded, confirmed, approved or introduced; We specially and expressly derogate each and every one of these, sufficiently for their own derogation and that of their whole import – special, specific, express and singular – and indeed, word for word.

9. It is Our will that copies or exemplars of this present Bull, including printed copies, once they have been signed by a public notary and stamped with the seal of an ecclesiastical dignitary, are to be given exactly the same credence, in all places and by all peoples, as would be given to this original if it were shown or exhibited.

Given in Rome, at St. Mary Major's, under the ring of the Fisherman, on the 5th day of March 1664, in the 9th year of Our pontificate. END

What is significant about the genre of Alexander VII's decree is not only its *forma specifica* venue but also how popes following him regarded Alexander's previous decrees. For example, in Pius IX's dogmatic declaration on the Immaculate Conception in 1854, he cites as supporting documentation the writings of Alexander VII more than any other pope. In reference to Alexander VII's apostolic constitution, *Sollicitudo Omnium Esslesiarum* of December 8, 1661, Pius IX says Alexander VII "*authoritatively and decisively declared the mind of the Church*" when he wrote: "Concerning the most Blessed Virgin Mary, Mother of God…her soul, in the first instant of its creation and in the first instant of the soul's infusion into the body, was, by a special grace of God…preserved free from all stain of original sin."[642] Here we see that Alexander VII's apostolic constitution, which could not have been considered on the same level as an infallible dogma since Pius IX lays sole claim to doing so in 1870, is, nevertheless, categorized as an official document that "authoritatively and decisively declared the mind of the Church." (NB: the doctrine of papal infallibility had not yet been defined and established for either *Sollicitudo* or *Ineffabilis*. That important wrinkle in Catholic magisterial protocol would only be formally established in 1870, and the Church reserves the right to make papal infallibility retroactive to any previous papal document. Prior to 1870, *Ineffabilis Deus* was designated as an "apostolic constitution"). As such, the logical question is: should not Alexander VII's 1664 papal bull, *Speculatores Domus Israel*, which is on the same or similar level of papal authority as his previous 1661 apostolic constitution, be given the same designation of a "authoritative and decisively declaring the mind of the Church," especially since in the prior fifty years (1616-1664) the "mind of the Church" had already been "declared and defined" stating that heliocentrism was "formally heretical" and "erroneous in faith"?

Some might argue that since Pius IX made *Ineffabilis Deus* (the doctrine of the Immaculate Conception) "infallible" this implies that Alexander VII's apostolic constitution of 1661 was not infallible, and neither was his papal bull of 1664. Argumentation along those lines, however, is self-defeating, since the only way Pius IX could have used Alexander VII's apostolic constitution as support for *Ineffabilis Deus* is if Pius IX held to the absolute truthfulness of Alexander's apostolic constitution on the Immaculate Conception, *Sollicitudo Omnium Esslesiarum*, regardless whether it is "infallible" under the 1870 definition. At this point it must also be understood that categorizing the Immaculate Conception as an infallible dogma doesn't make it any more true. Truth as truth, at least from the divine perspective, doesn't change with the level of authoritative format given to it by the Church. The various levels of authority given to certain doctrines are more for our limitations and weaknesses than an admission that there are degrees of truth. When a dogma is declared "infallible" it means that all debate and doubt among human beings must stop, and those who deliberately reject the dogma will now be excommunicated. As such, the "infallibility" of a dogma does not make it truer, *per se*; rather, it makes our required allegiance to the doctrine absolute and unequivocal. In regard to doctrinal propositions, there can only be truth or error. If the Church regards a certain doctrine on the lowest rungs of authority (*e.g.*, as either "safe," "very common," or

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[642] *Ineffabilis Deus*, Pope Pius IX, December 8, 1854.

"probable") this does not make the doctrine any less true if it is indeed already true. It only shows that the Church has either not studied the doctrine sufficiently or that no divine revelation has been given regarding its truth or falsity. Be that as it may, there has been no time in history where one pope has declared a previous pope's apostolic constitution false, and for all intents and purposes, it will never happen. By the same token, no pope has ever declared Alexander VII's bull, *Speculatores Domus Israel* false, and never will.

Interestingly enough, in his apostolic constitution on the Immaculate Conception, Alexander VII refers back to Paul V, the pope who dealt with Galileo in 1616, for support of the doctrine. He writes: "we renew the Constitutions and Decrees issued by the Roman Pontiffs, our predecessors, especially Sixtus IV, Paul V and Gregory XV in favor of the doctrine asserting that the soul of the Blessed Virgin…was preserved from original sin." Alexander VII also adds penalties for those who would disobey his 1661 decree on the Immaculate Conception:

> …we hereby declare that in addition to the penalties and censures contained in the Constitutions issued by Sixtus IV…we hereby decree that they be deprived of the authority of preaching, reading in public, that is to say teaching and interpreting…and hereby renue the above Decrees and Constitutions of Paul V and Gregory XV.

He then adds a reference to the *Index* in connection with his decree on the Immaculate Conception:

> Moreover, as regards those books in which the said sentence, feast and relative veneration are called into question or are contradicted in any way whatsoever, according to what has already been stated, either in writing or verbally, in discourses, sermons, lectures, treatises and debates – that may have been printed after the above-praised Decree of Paul V, or may be printed hereafter we hereby prohibit them, subject to the penalties and censures established by the *Index of Prohibited Books*, and *ipso facto*, without any further declaration, we desire and command that they be held as expressly prohibited.[643]

Here we see that Paul V's decrees are considered as authoritative as Alexander VII's, and it is no coincidence that both these popes issued and/or approved strong condemnations against heliocentrism; and they, along with Urban VIII, were just as adamant to preserve the explicit scriptural truth that the sun revolved around the Earth as they were to protect the implicit scriptural truth that Mary was immaculately conceived. It is obvious that none of them considered their decrees on either subject "reformable."

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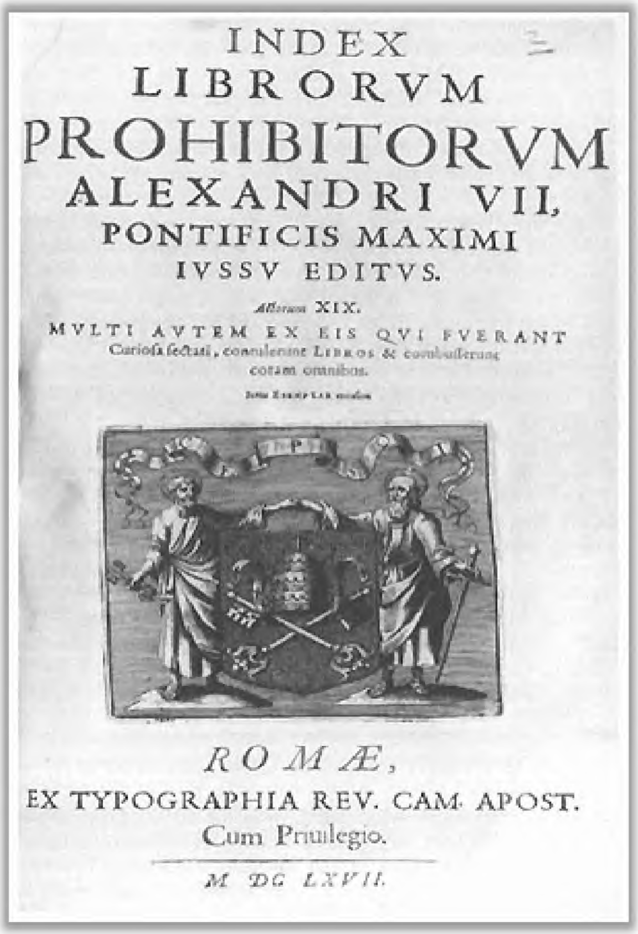
[643] Alexander VII: *Sollicitudo Omnium Esslesiarum*, December 8, 1661.



INDEX
LIBRORVM
PROHIBITORVM
ALEXANDRI VII,
PONTIFICIS MAXIMI
IVSSV EDITVS.

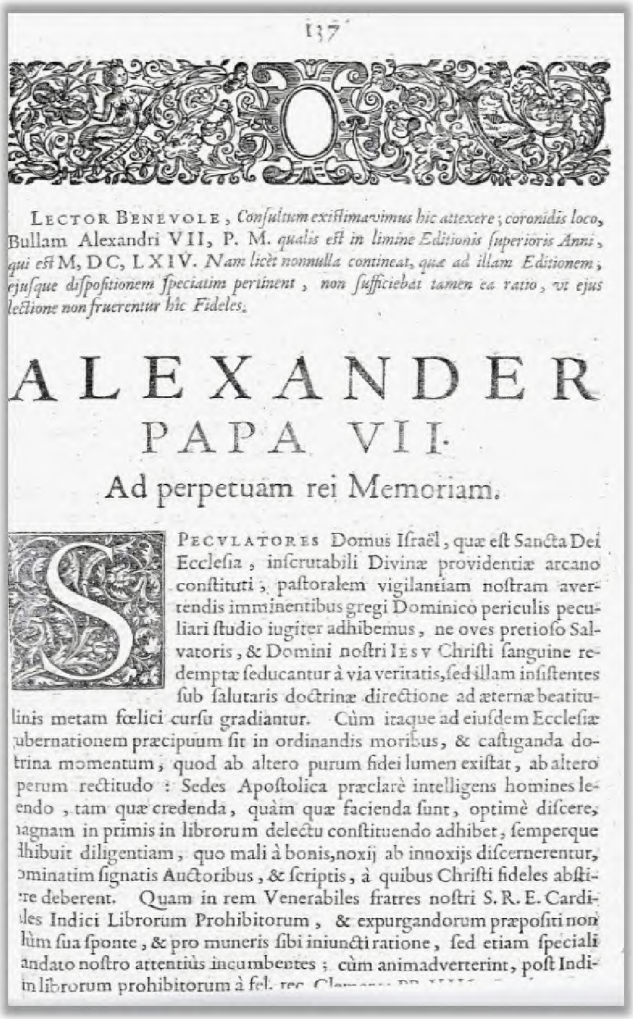
Actorum XIX.
MVLTI AVTEM EX EIS QVI FVERANT
Curioſa ſectati, contulerunt LIBROS & combuſſerunt
coram omnibus.

[illegible]

ROMÆ,
EX TYPOGRAPHIA REV. CAM. APOST.
Cum Priuilegio.

M DC LXVII.

Cover page of Alexander VII's *Index of Forbidden Books*



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Lector Benevole, *Conſultum exiſtimavimus hic attexere; coronidis loco,* Bullam Alexandri VII, P. M. *qualis eſt in limine Editionis ſuperioris Anni, qui eſt* M, DC, LXIV. *Nam licèt nonnulla contineat, quæ ad illam Editionem, ejuſque diſpoſitionem ſpeciatim pertinent, non ſufficiebat tamen ea ratio, vt ejus lectione non fruerentur hic Fideles.*

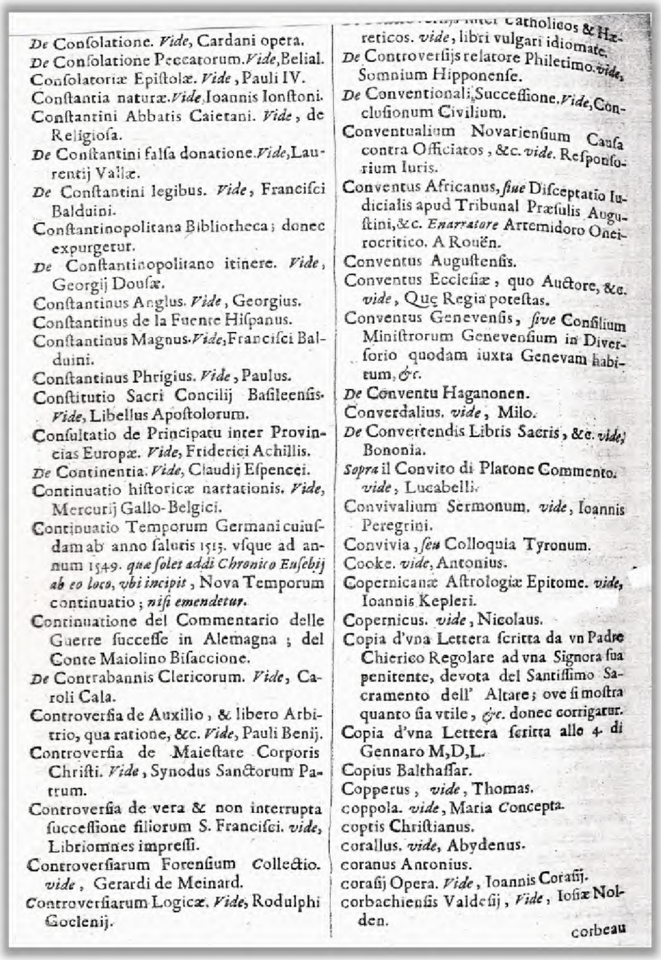
ALEXANDER
PAPA VII.
Ad perpetuam rei Memoriam.

SPECVLATORES Domus Iſraël, quæ eſt Sancta Dei Eccleſia, inſcrutabili Divinæ providentiæ arcano conſtituti, paſtoralem vigilantiam noſtram avertendis imminentibus gregi Dominico periculis peculiari ſtudio iugiter adhibemus, ne oves pretioſo Salvatoris, & Domini noſtri IESV Chriſti ſanguine redemptæ ſeducantur à via veritatis, ſed illam inſiſtentes ſub ſalutaris doctrinæ directione ad æternæ beatitudinis metam fœlici curſu gradiantur. Cùm itaque ad eiuſdem Eccleſiæ ubernationem præcipuum ſit in ordinandis moribus, & caſtiganda doctrina momentum, quod ab altero purum fidei lumen exiſtat, ab altero perum rectitudo: Sedes Apoſtolica præclarè intelligens homines leendo, tam quæ credenda, quàm quæ facienda ſunt, optimè diſcere, ıagnam in primis in librorum delectu conſtituendo adhibet, ſemperque lhibuit diligentiam, quo mali à bonis, noxij ab innoxijs diſcernerentur, ominatim ſignatis Auctoribus, & ſcriptis, à quibus Chriſti fideles abſtire deberent. Quam in rem Venerabiles fratres noſtri S. R. E. Cardiles Indici Librorum Prohibitorum, & expurgandorum præpoſiti non lùm ſua ſponte, & pro muneris ſibi iniuncti ratione, ſed etiam ſpeciali andato noſtro attentiùs incumbentes; cùm animadverterint, poſt Indiin librorum prohibitorum à fel. rec.

First page of the papal bull, *Speculatores Domus Israel*

Within the Index attached to the bull there are separate pages of condemnation for the books of Copernicus, Galileo, and Kepler.

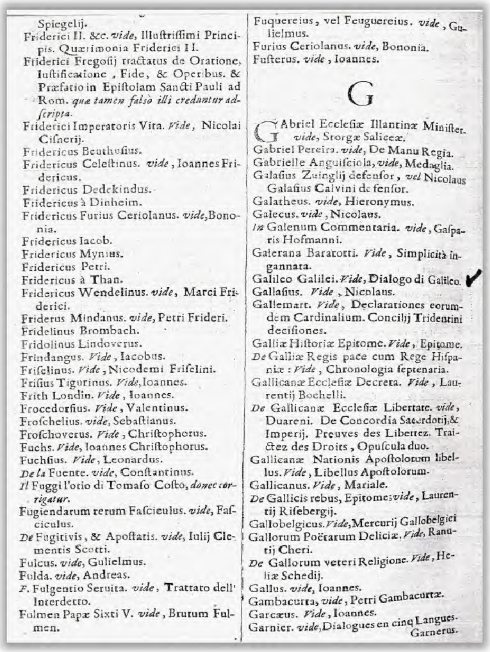
- Copernicus is on page 30:
- Galileo is on page 52:
- Kepler is on page 73



De Conſolatione. *Vide*, Cardani opera.
De Conſolatione Peccatorum. *Vide*, Belial.
Conſolatoriæ Epiſtolæ. *Vide*, Pauli IV.
Conſtantia naturæ. *Vide*, Ioannis Ionſtoni.
Conſtantini Abbatis Caietani. *Vide*, de Religioſa.
De Conſtantini falſa donatione. *Vide*, Laurentij Vallæ.
De Conſtantini legibus. *Vide*, Franciſci Balduini.
Conſtantinopolitana Bibliotheca; donec expurgetur.
De Conſtantinopolitano itinere. *Vide*, Georgij Douſæ.
Conſtantinus Anglus. *Vide*, Georgius.
Conſtantinus de la Fuente Hiſpanus.
Conſtantinus Magnus. *Vide*, Franciſci Balduini.
Conſtantinus Phrigius. *Vide*, Paulus.
Conſtitutio Sacri Concilij Baſileenſis. *Vide*, Libellus Apoſtolorum.
Conſultatio de Principatu inter Provincias Europæ. *Vide*, Friderici Achillis.
De Continentia. *Vide*, Claudij Eſpencei.
Continuatio hiſtoricæ narrationis. *Vide*, Mercurij Gallo-Belgici.
Continuatio Temporum Germani cuiuſdam ab anno ſalutis 1515. vſque ad annum 1549. *quæ ſolet addi Chronico Euſebij ab eo loco, vbi incipit*, Nova Temporum continuatio; *niſi emendetur.*
Continuatione del Commentario delle Guerre ſucceſſe in Alemagna; del Conte Maiolino Biſaccione.
De Contrabannis Clericorum. *Vide*, Caroli Cala.
Controverſia de Auxilio, & libero Arbitrio, qua ratione, &c. *Vide*, Pauli Benij.
Controverſia de Maieſtate Corporis Chriſti. *Vide*, Synodus Sanctorum Patrum.
Controverſia de vera & non interrupta ſucceſſione filiorum S. Franciſci. *vide*, Libri omnes impreſſi.
Controverſiarum Forenſium Collectio. *vide*, Gerardi de Meinard.
Controverſiarum Logicæ. *Vide*, Rodulphi Goclenij.

inter Catholicos & Hæreticos. *vide*, libri vulgari idiomate.
De Controverſijs relatore Philetimo. *vide*, Somnium Hipponenſe.
De Conventionali Succeſſione. *Vide*, Concluſionum Civilium.
Conventualium Novarienſium Cauſa contra Officiatos, &c. *vide*. Reſponſorium Iuris.
Conventus Africanus, *ſiue* Diſceptatio Iudicialis apud Tribunal Præſulis Auguſtini, &c. *Enarratore* Artemidoro Oneirocritico. A Rouën.
Conventus Auguſtenſis.
Conventus Eccleſiæ, quo Auctore, &c. *vide*, Quę Regia poteſtas.
Conventus Genevenſis, *ſive* Conſilium Miniſtrorum Genevenſium in Diverſorio quodam iuxta Genevam habitum, *&c.*
De Conventu Haganonen.
Converdalius. *vide*, Milo.
De Convertendis Libris Sacris, &c. *vide*, Bononia.
Sopra il Convito di Platone Commento. *vide*, Lucabelli.
Convivalium Sermonum. *vide*, Ioannis Peregrini.
Convivia, *ſeu* Colloquia Tyronum.
Cooke. *vide*, Antonius.
Copernicanæ Aſtrologiæ Epitome. *vide*, Ioannis Kepleri.
Copernicus. *vide*, Nicolaus.
Copia d'vna Lettera ſcritta da vn Padre Chierico Regolare ad vna Signora ſua penitente, devota del Santiſſimo Sacramento dell' Altare; ove ſi moſtra quanto ſia vtile, *&c.* donec corrigatur.
Copia d'vna Lettera ſcritta allo 4. di Gennaro M,D,L.
Copius Balthaſſar.
Copperus, *vide*, Thomas.
coppola. *vide*, Maria Concepta.
coptis Chriſtianus.
corallus. *vide*, Abydenus.
coranus Antonius.
coraſij Opera. *Vide*, Ioannis Coraſij.
corbachienſis Valdeſij, *Vide*, Ioſiæ Nolden.

corbeau



Spiegelij.
Friderici II. &c. *vide*, Illuſtriſſimi Principis. Quærimonia Friderici II.
Friderici Fregoſij tractatus de Oratione, Iuſtificatione, Fide, & Operibus. & Præfatio in Epiſtolam Sancti Pauli ad Rom. *quæ tamen falsò illi creduntur adſcripta.*
Friderici Imperatoris Vita. *Vide*, Nicolai Ciſnerij.
Fridericus Beuthoſius.
Fridericus Celeſtinus. *vide*, Ioannes Fridericus.
Fridericus Dedekindus.
Fridericus à Dinheim.
Fridericus Furius Ceriolanus. *vide*, Bononia.
Fridericus Iacob.
Fridericus Mynius.
Fridericus Petri.
Fridericus à Than.
Fridericus Wendelinus. *vide*, Marci Friderici.
Friderus Mindanus. *vide*, Petri Frideri.
Fridelinus Brombach.
Fridolinus Lindoverus.
Frindangus. *Vide*, Iacobus.
Friſelinus. *Vide*, Nicodemi Friſelini.
Friſius Tigurinus. *Vide*, Ioannes.
Frith Londin. *Vide*, Ioannes.
Frocedorfius. *Vide*, Valentinus.
Froſchelius. *vide*, Sebaſtianus.
Froſchoverus. *Vide*, Chriſtophorus.
Fuchs. *Vide*, Ioannes Chriſtophorus.
Fuchſius. *Vide*, Leonardus.
De la Fuente. *vide*, Conſtantinus.
Il Fuggi l'otio di Tomaſo Coſto, *donec corrigatur.*
Fugiendarum rerum Faſciculus. *vide*, Faſciculus.
De Fugitivis, & Apoſtatis. *vide*, Iulij Clementis Scotti.
Fulcus. *vide*, Gulielmus.
Fulda. *vide*, Andreas.
F. Fulgentio Seruita. *vide*, Trattato dell' Interdetto.
Fulmen Papæ Sixti V. *vide*, Brutum Fulmen.
Fuquereius, vel Feuguereius. *vide*, Gulielmus.
Furius Ceriolanus. *vide*, Bononia.
Fuſterus. *vide*, Ioannes.

G

GAbriel Eccleſiæ Illantinæ Miniſter. *vide*, Storgæ Saliceæ.
Gabriel Pereira. *vide*, De Manu Regia.
Gabrielle Anguiſciola, *vide*, Medaglia.
Galaſius Zuinglij defenſor, *vel* Nicolaus Galaſius Calvini defenſor.
Galatheus. *vide*, Hieronymus.
Galecus. *vide*, Nicolaus.
In Galenum Commentaria. *vide*, Gaſparis Hofmanni.
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Gallicanæ Eccleſiæ Decreta. *Vide*, Laurentij Bochelli.
De Gallicanæ Eccleſiæ Libertate. *vide*, Duareni. De Concordia Sacerdotij, & Imperij. Preuves des Libertez. Traictez des Droits, Opuſcula duo.
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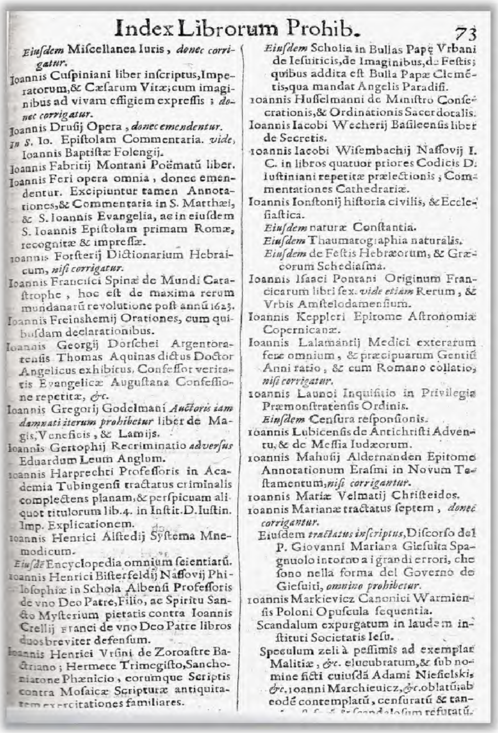
Gambacurta, *vide*, Petri Gambacurtæ.
Garcæus. *Vide*, Ioannes.
Garnier. *vide*, Dialogues en cinq Langues.
Garnerus.



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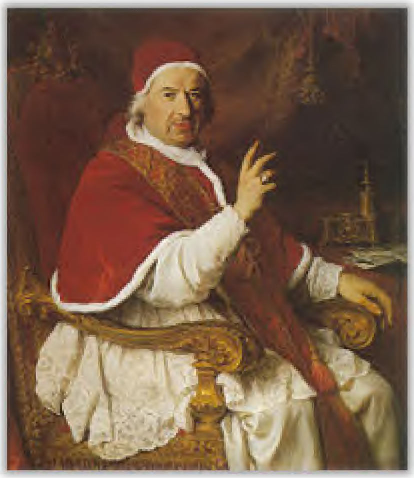
Eiuſdem Miſcellanea Iuris, *donec corrigatur.*
Ioannis Cuſpiniani liber inſcriptus, Imperatorum, & Cæſarum Vitæ; cum imaginibus ad vivam effigiem expreſſis; *donec corrigatur.*
Ioannis Druſij Opera, *donec emendentur.*
In S. Io. Epiſtolam Commentaria. *vide*, Ioannis Baptiſtæ Folengij.
Ioannis Fabritij Montani Poëmatũ liber.
Ioannis Feri opera omnia, donec emendentur. Excipiuntur tamen Annotationes, & Commentaria in S. Matthæi, & S. Ioannis Evangelia, ac in eiuſdem S. Ioannis Epiſtolam primam Romæ, recognitæ & impreſſæ.
Ioannis Forſterij Dictionarium Hebraicum, *niſi corrigatur.*
Ioannis Franciſci Spinæ de Mundi Cataſtrophe, hoc eſt de maxima rerum mundanarũ revolutione poſt annũ 1623.
Ioannis Freinshemij Orationes, cum quibuſdam declarationibus.
Ioannis Georgij Dorſchei Argentoratenſis Thomas Aquinas dictus Doctor Angelicus exhibitus, Confeſſor veritatis Evangelicæ Auguſtana Confeſſione repetitæ, *&c.*
Ioannis Gregorij Godelmani *Auctoris iam damnati iterum prohibetur* liber de Magis, Veneficis, & Lamijs.
Ioannis Gertophij Recriminatio *adverſus* Eduardum Leum Anglum.
Ioannis Harprechti Profeſſoris in Academia Tubingenſi tractatus criminalis complectens planam, & perſpicuam aliquot titulorum lib. 4. in Inſtit. D. Iuſtin. Imp. Explicationem.
Ioannis Henrici Alſtedij Syſtema Mnemodicum.
Eiuſdẽ Encyclopedia omnium ſcientiarũ.
Ioannis Henrici Biſterfeldij Naſſovij Philoſophiæ in Schola Albenſi Profeſſoris de vno Deo Patre, Filio, ac Spiritu Sancto Myſterium pietatis contra Ioannis Crellij Franci de vno Deo Patre libros duos breviter defenſum.
Ioannis Henrici Vrſini de Zoroaſtre Bactriano; Hermete Trimegiſto, Sanchoniatone Phænicio, eorumque Scriptis contra Moſaicæ Scripturæ antiquitatem exercitationes familiares.
Eiuſdem Scholia in Bullas Papę Vrbani de Ieſuiticis, de Imaginibus, de Feſtis; quibus addita eſt Bulla Papæ Clemẽtis, qua mandat Angelis Paradiſi.
Ioannis Huſſelmanni de Miniſtro Conſecrationis, & Ordinationis Sacerdotalis.
Ioannis Iacobi Wecherij Baſileenſis liber de Secretis.
Ioannis Iacobi Wiſembachij Naſſovij I. C. in libros quatuor priores Codicis D. Iuſtiniani repetitæ prælectionis, Commentationes Cathedrariæ.
Ioannis Ionſtonij hiſtoria civilis, & Eccleſiaſtica.
Eiuſdem naturæ Conſtantia.
Eiuſdem Thaumatographia naturalis.
Eiuſdem de Feſtis Hebræorum, & Græcorum Schediaſma.
Ioannis Iſaaci Pontani Originum Francicarum libri ſex. *vide etiam* Rerum, & Vrbis Amſtelodamenſium.
Ioannis Keppleri Epitome Aſtronomiæ Copernicanæ.
Ioannis Lalamantij Medici exterarum feræ omnium, & præcipuarum Gentiũ Anni ratio, & cum Romano collatio, *niſi corrigatur.*
Ioannis Launoi Inquiſitio in Privilegia Præmonſtratenſis Ordinis.
Eiuſdem Cenſura reſponſionis.
Ioannis Lubicenſis de Antichriſti Adventu, & de Meſſia Iudæorum.
Ioannis Mahuſij Aldernanden Epitome Annotationum Eraſmi in Novum Teſtamentum, *niſi corrigantur.*
Ioannis Mariæ Velmatij Chriſteidos.
Ioannis Marianæ tractatus ſeptem, *donec corrigantur.*
Eiuſdem *tractatus inſcriptus*, Diſcorſo del P. Giovanni Mariana Gieſuita Spagnuolo intorno a i grandi errori, che ſono nella forma del Governo de Gieſuiti, *omnino prohibetur.*
Ioannis Markievicz Canonici Warmienſis Poloni Opuſcula ſequentia.
Scandalum expurgatum in laudem inſtituti Societatis Ieſu.
Speculum zeli à peſſimis ad exemplar Malitiæ, *&c.* elucubratum, & ſub nomine ficti cuiuſdã Adami Nieſielski, *&c.* Ioanni Marchieuicz, *&c.* oblatũ; ab eodẽ contemplatũ, cenſuratũ & tan- [illegible] & ſcandaloſum refutatũ.

Their absolute resolve on both issues is a fact of history that no one can change. The question remaining for the modern Church is: will we be forced to succumb to the world's pressure to regard these successors of Peter as making an erroneous judgment on one doctrine but making a correct judgment on another, or will we be honest and admit that they were guided by the same Holy Spirit to affirm both doctrines as true?

The First Index of Benedict XIV

After the 1664 papal bull of Alexander VII, the next official declarations concerning the aftermath of the Galileo affair occurred in 1741 and 1758 when under the reign of **Pope Benedict XIV** (1740-1758) the Holy Office granted an imprimatur to the first edition of the complete works of Galileo in addition to omitting the general prohibition of Copernican books for the new *Index*.



As we noted earlier, however, the imprimatur was granted under the condition that the stipulations of the Padua Inquisitor, Paolo A. Ambrogi, be observed. The result was that the publication in 1744 had to exclude Galileo's *Letter to Christina* and the *Letter to Castelli*, which were two of Galileo's most formidable defenses of Copernicanism. Furthermore, Galileo's *Dialogue of the Two Great World Systems* had to be printed in Volume IV and accompanied by the 1633 sentence against Galileo (*i.e.*, "vehemently suspected" of "formal heresy"), as well as the text of Galileo's abjuration. The most important feature of the re-publication was that it was required to contain a preface emphasizing the "hypothetical" character of the book's contents. This requirement shows the consistency of the Church's position, for the same permission was granted to the works of Copernicus in 1620.

The road to the imprimatur was long and arduous, however. Rome was very cautious about what would be allowed and disallowed in the text. The events unfolded as follows. On September 29, 1741, Ambrogi wrote to the Inquisition in Rome seeking for permission for the Padua seminary to publish Galileo's complete works, with the promise to make the *Dialogo* hypothetical and to include Galileo's abjuration. On October 9, the Inquisition approved the project. Ambrogi wrote a second letter to the Inquisition on February 10, 1742 requesting permission to keep the *Dialogo* intact as it was written by Galileo but to include a preface that stipulated the Church's 1633 condemnation of both Galileo and the *Dialogo*. The seminary also wanted to include Galileo's *Letter to Christina*. Excerpts from the book's preface that Ambrogi submitted to the Inquisition are as follows:

> O learned Christan reader, here is a beautiful example of humility and submission to the decisions of the Holy Roman Church. What I present to you is Galileo Galilei's famous *Dialogue on the Two Chief Systems, Ptolemaic and Copernican*. In this *Dialogue*, he [Galileo] showed too much fondness for the second [Copernicanism], which is not compatible with Holy Writ; thus, he later repented and performed a solemn abjuration and retraction….Indeed, I have wanted the remedy to precede the disease in print, by prefacing to the dialogue itself the sentence pronounced against him and the ready mortification he showed toward the venerable decisions of the Holy Office; for he declared that what he had written on the subject, impulsively and out of intellectual vanity, was not only false but also improbable, because it was contrary to the divine scriptures. Given, then, that the Copernican hypothesis is false and untenable, and that I also condemn and detest it in the clearest manner and for the same reason, you can make use of the other admirable doctrines that are coincidentally found scattered on almost every page.[644]

On March 17, 1742 Rome replied and stated that as long as the stipulated guidelines were followed, the imprimatur could be granted. Excerpts from the reply are recorded below. We notice the extreme care the Sacred Congregation took to abide by the decrees of 1616 and 1633 when granting the imprimatur.

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[644] Translated from the anonymous Italian text transcribed and published by Mayaud, Rome: Editrice Pontifica Università Gregoriana, 1997, pp. 136-137, as cited in Finocchiaro's *Retrying Galileo*, pp. 127-128.

> Last September the Father Inquisitor informed this Supreme Congregation of the petition made to him for permission to reprint all of Galilei's works. To obtain it, the printer obliged himself to print all declarations that might be prescribed by this Supreme Congregation; to include in the fourth volume the abjuration made by the author; to do everything possible to change the exposition to a hypothetical one, as it had been done there [in Padua] for the reprinting of Pourchot; and finally to have the correction done with the assistance of men who are learned and of proven Catholic religion….The committee of Consultants specially appointed by His Holiness decided that one should reply to the Father Inquisitor of Padua to permit the printing of the works in question, but only on the conditions described by the Father Inquisitor….Note that the needed searches have been made in the archives and the chancellery of this Supreme Tribunal in regard to Galileo's works.[645]

On May 20, 1742, Ambrogi again wrote to Rome on behalf of the editors and asked if, instead of changing the *Dialogo's* text they could make deletions and changes in the marginal postils of the book. They also stated that they would not be including Galileo's *Letter to Christina* but would like to include a published essay by biblical scholar Augustin Calmet, a French Benedictine friar who defended the geocentric worldview based on an exegesis from Scripture. Rome responded on June 6 stating that it wanted more information on how and why the Church had previously decided that the Copernican system could be permitted as a hypothesis. Friar Luigi Maria Giovasco was assigned to this task. On June 13, the Inquisition approved the book on the following recommendation by Giovasco. We notice in the Inquisition's approval that the heliocentric system is tied directly to Pythagoras, thus showing the 1742 Church's recognition that the battle over cosmology was a long-running one, which began when the Church Fathers held fast to the fixed Earth of Scripture against the moving Earth of the Greek philosophers:

> …*On the Revolutions of the Heavenly Spheres* by Nicolaus Copernicus…and a work by Diego de Zúñiga …supported the ancient opinion of Pythagoras, who taught that the Sun was the motionless center of the world and that the terraqueous globe of

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[645] Mayaud, pp. 137-138, *Retrying Galileo*, *op. cit.*, p. 128.

> the Earth turned around it with perpetuated motion. The Carmelite Father Paolo Antonio Foscarini adopted such a system and defended it against the censure of theologians, who judged it false and contrary to Sacred Scripture. This system, which is commonly called Copernican for having been reawakened by Copernicus from the ashes of the ancient philosophy of Pythagoras, was denounced to the Sacred Congregation of the Index. On March 5, 1616, this Congregation published a decree prohibiting the system as a false Pythagorean doctrine contrary to Sacred Scripture and prejudicial to Catholic truth. But there was this difference: that Father Foscarini's *Letter* was prohibited absolutely, whereas Copernicus' book and Diego de Zúñiga *Commentaries on Job* were merely suspended, until corrected.

Rome then responds to the specific request of Ambrogi. We notice again how close the Inquisition follows the history so as to show the continuity of the thinking process from 1616 to 1742:

> Then some publishers approached the same Sacred Congregation of the Index to have the above corrections of the above-mentioned works and to be able to publish them, exempt from the announced suspension…So another decree appeared declaring that the system should be understood as condemned only when it was expounded as an absolute thesis, but not when it was expounded as a hypothesis to better know the revolutions of the heavenly spheres. These corrections appeared in a decree of the Sacred Congregation of the Index of the year 1620. They emended the chapters of Copernicus' work in such a way that the printed text is left intact where it speaks problematically, and it is changed to mere hypothesis where it speaks in the manner of a doctrinal and absolute thesis. Corrected in this way, Copernicus' work is even today free of any condemnation. Indeed, all astronomers study the moon by following Copernicus and tell us that they follow such a system in the manner of a hypothesis and not in the manner of a thesis, for they think it is more useful for contemplating the oppositions and phenomena of the stars. In the year 1633, there appeared the *Dialogue* of Galileo Galilei…in which he established the Pythagorean system in the manner of a thesis. So it was prohibited…beause it defended and advocated such a system in the manner of a thesis and not in the manner of an imagined hypothesis.

> Thus it seems that by reprinting in Padua the works of Galileo Galilei, among which there is the prohibited *Dialogue*…by including the decrees and Galileo's retraction, as the printer promises; with the marginal notes referring to the prohibition to speak of the subject in the manner of a thesis and to the fact that one may discuss it only in the manner of a hypothesis; with the addition of Father Calmet's dissertation, which for its part confutes such a system if taken in the manner of a thesis; by all these means one remedies very well the damage of this printing, and one corrects the daring of the modern philosophers who accuse of injustice the Roman condemnation and censure of such a system.[646]

As the Inquisition is writing this letter in 1742, various astronomical phenomena had been and were being discovered, which some astronomers presumptuously interpreted as demonstrating the Earth was moving through space. Here we quote from *Volume I*, to give the details of these events:

> As early as 1640 the astronomer Giovanni Pieroni observed that various stars shifted their position in the sky during the year. As we noted earlier, Francesco Rinuccini brought this evidence to Galileo's attention in 1641, but Galileo was unimpressed. Robert Hooke, three decades later, in 1669, noticed the same kind of shifting for one star in particular, named *Gamma Draconis*. Since everyone from the time of Copernicus had been looking for physical evidence of a moving Earth, Hooke actually thought he had discovered the first parallax as proof. Almost another thirty years later (1694), John Flamsteed observed the same kind of shifting in the star Polaris. Another thirty years later, James Bradley (d. 1762) set out to determine whether Hooke's observations were, indeed, a parallax of *Gamma Draconis*. During the years of 1725-1728 he noticed that during the course of a year the star inscribed a small ellipse in its path, almost the same as a parallax would make. In the heliocentric system, parallax is understood as a one-to-one correspondence between Earth's annual revolution and the star's annual ellipse, but Bradley noticed that the star's ellipse was not following this particular pattern.

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[646] Mayaud, pp. 146-148, *Retrying Galileo*, *op. cit.*, pp. 130-131.

> At this point, astronomical science was still waiting for a confirmed parallax of any star, since no one had ever measured one. A confirmed measurement of parallax would not be made until more than a century later by Friedrich Bessel in 1838. So Bradley, reasoning that *Gamma Draconis* was too far away to register a parallax, found another explanation, and it was rather an ingenious one. He theorized that the star's annual ellipse was being formed because the speed of light was finite. That is, the star wasn't actually moving in the sky; rather, its light, moving at a finite speed, was hitting a moving Earth, an Earth that for six months was moving toward the star, and in the next six months was moving away from the star. While the Earth moved toward the star, the star's light would hit the Earth sooner, but while the Earth moved away, the light would hit it later. Bradley reasoned that, if light's speed was infinite, there would be no such effect, but since it is finite, these back-and-forth movements of the Earth would translate into seeing the star move in an ellipse in the sky over the course of a year. This explanation was a welcome relief for the heliocentric view, since until Bradley, no one, including Galileo who died in 1642, had supplied any real evidence that the Earth could be revolving around the sun.[647]

Neither stellar aberration nor stellar parallax prove the Earth is in motion; rather, a moving Earth is only one of at least two ways to explain these particular stellar phenomena. The geocentric solution, of course, is a rotating universe of fixed stars around a fixed Earth – the cosmology of Scripture and Catholic tradition. Nevertheless, the Catholic magisterium was willing to accommodate the aspirations of the then Copernican alternative by allowing various scientific treatises to at least regard a moving Earth as a hypothesis for the simple reason that modern astronomers "think it is more useful for contemplating the oppositions and phenomena of the stars,"[648] which is the Church's factual acknowledgment of stellar aberration and/or stellar parallax but without any commitment to the Copernican interpretation. One was permitted to "contemplate" the Copernican version of stellar aberration and stellar parallax if it made charting the heavens easier (just as naval navigators today use the geocentric system to chart positions at sea, even though they believe heliocentrism is the actual reality), but he could not declare it as the actual reality.[649]

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[647] *Galileo Was Wrong: The Church Was Right*, Vol. I, pp. 130-131.

[648] Stated by Friar Luigi Mario Govasco, assigned by the Inquisition to answer the inquiry of the Padua inquisitor, Paolo Ambrogi, Mayaud, p. 148.

The crucial point to be made here is this: although the Church of 1616 did not have the evidence of stellar aberration or parallax available to the Church of 1742, nevertheless, both ecclesiastical authorities allowed Copernicanism as a hypothesis, since both agreed that Scripture provided the only correct interpretation of celestial events – a fixed earth within a rotating universe, not vice-versa. This historical fact may be the watershed of the whole controversy, since at no time after the Church's 1616 decision to allow Copernicanism as a hypothesis did the Church ever rescind that allowance or permit more than that allowance. Today, as far as the Catholic Church is concerned, modern astronomers can speak and write about Copernicanism with relative freedom, provided they understand that, in the legal forum of the discussion, the Church still maintains that geocentrism is the only official interpretation the Church has ever, or will ever, accept as the correct one, and that all other models are mere hypotheses that can never be regarded as true. The simple reason is: several hypotheses can coexist in theory, but there can only be one true model in reality.

The Second Index of Pope Benedict XIV, 1758

Regarding the 1758 decision, we noted earlier that no *carte blanche* permission was given to Copernican cosmology; rather, the decree contained precautionary and limiting stipulations very similar to the 1741 decision. We can understand these stipulations if we reflect on the prohibitions in the 1619 edition of the *Index*. It, as well as subsequent editions, had two categories of prohibitions for Copernican works: specific works and general works. The edition of 1758 excluded only the general. Still included were Copernicus' *De Revolutionibus*, Galileo's *Dialogo* and

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[649] This rationale for allowing Copernicanism as a hypothesis answers Antonio Maria Grandi's objection, voiced by the Commissary General of the 1820 Index for support of Canon Settele's imprimatur, arguing that "If the system had been judged erroneous or heretical, the Church would never have allowed it to be maintained even as a hypothesis; the reason is that otherwise those who studied it would be placed at risk of sinning against the Faith, in case they judged the system to be manifestly demonstrated" (*Retrying Galileo*, pp. 206-207). As such, the hypothesis of Copernicanism would be no more dangerous than Jesus' use of hypothetical stories (e.g., parables) to express a given point, even at the risk of having the sinfully obstinate audience misinterpret the hypothesis (cf., Matt. 13:10-17). If the true interpretation is known and has been declared, it is the responsibility of the audience to adhere to that interpretation.

Kepler's *Epitome*, obviously intending to give no endorsement to Copernican cosmology.

In light of its conclusion, the events that led to the 1758 decision are important to know. In July 1753, Pope Benedict XIV issued a bull titled *Sollicita ac Provida* directing reforms of the criteria for publications that would be prohibited by the *Index of Forbidden Books*. In January 1754, Agostino Ricchini, secretary to the Congregation of the Index, inquiring to the pope for additional reforms, desired to remove the ban on various books if proper corrections were made to them.[650] Among the examples he cited were works by Descartes, Copernicus and Galileo. Without much ado, Benedict XIV approved Ricchini's request on February 12, 1754. The important point that cannot be missed in this simple transaction is that the basis upon which any changes to the Index were approved, or any prohibitions of the heliocentric system were relaxed, centered consistently upon the stipulation that the proposed book must contain the "proper corrections," namely, that the use of the Copernican system not be promoted as a thesis, but as a hypothesis. Hence, on that specific basis, on April 1757, with the apparent approval of Benedict XIV, the Congregation of the Index eliminated the prohibition concerning "all books teaching the earth's motion and the sun's immobility,"[651] and thus the new *Index* was published in 1758, although it still included the prohibition against Copernicus, Foscarini, Zúñiga, Kepler and Galileo, perhaps because they stood "uncorrected" in their present form.

Not surprisingly, Galileo historians analyzing the situation from hindsight and predisposed to viewing heliocentrism as the correct model of cosmology, puzzle over what, in the words of Mayaud, seems to be an "illogical decision," or in the words of Finocchiaro, seems to be an "incomplete censure" by the *Index*. As they see it, a complete exoneration of Copernicus, Foscarini, Zúñiga, Kepler and Galileo was long overdue. What they fail to see, however, is that the Church was being entirely consistent to what its previous authorities had decreed. Copernicus, Foscarini, Zúñiga, Kepler and Galileo had already been condemned and there would be no lifting of their condemnations for the simple fact that heliocentrism was not suddenly proven correct in 1757. The Church maintained the decision made in 1620 to allow Copernicanism to be published as a hypothetical model and nothing more. Those that advocated it as more than a hypothesis (*e.g.*, Copernicus, Foscarini, Zúñiga, Kepler and Galileo) logically deserved to retain the status of being censured.

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[650] Finocchiaro notes: "…Agostino Ricchini, proposed to the pope…the possibility of lifting the prohibition of some books after proper correction" (*Retrying Galileo*, p. 138).

[651] Finocchiaro, *ibid*., p. 139, citing various sources, including *Le Opere di Galileo Galilei*, vol. 19, p. 419; Karl Gebler's *Galileo and the Roman Curia*, pp. 312-313; Pierre-Noël Mayaud, *La Condamnation des Livres Coperniciens et sa Révocation à la Lumière de Documents Inédits des Congrégations de l'Index et de l'Inquisition*, 1997, p. 197.

We must also conclude, then, that the removal of the all-inclusive sentence: "all books teaching the earth's motion and the sun's immobility" did not mean that other books could be published that taught heliocentrism as a fact. The 1758 Index laid the foundation for the meaning and intent of its decision to remove the all-inclusive sentence when it specified that Descartes, Copernicus and Galileo could be published if they contained the "proper corrections." Obviously, the Congregation of the Index would not require Descartes, Copernicus and Galileo to treat heliocentrism hypothetically yet allow "all [other] books teaching the earth's motion" to do so as a fact. Accordingly, the 1758 decision contains no specific stipulation that "all [other] books" could treat heliocentrism as a fact. Hence, the intended meaning must be that "all [other] books" teaching heliocentrism could do so only if they published it as a hypothesis, just as it was required of Descartes, Copernicus and Galileo. Since logic demands consistency, the burden of proof rests with any contrary assessment.

Nevertheless, the question may surface as to why the 1758 Index chose to remove the all-inclusive sentence at all if it remained firm in its intent to bar all books that taught heliocentrism as a fact. The probable reason is that the all-inclusive sentence might have been erroneously interpreted to mean that no other book could even teach heliocentrism as a hypothesis. But since the Church, even in 1616, never said heliocentrism was prohibited from being presented as a hypothesis, it was better, in light of Ricchini's specific request to publish heliocentric works with the "proper corrections," to delete the all-inclusive sentence so as to give no suggestion that hypothetical works on heliocentrism were barred from publication.

This potential problem in the all-inclusive sentence stems from the paragraph in which it was originally drafted in 1616. The decree reads:

> And whereas it has also come to the knowledge of the said Congregation that the Pythagorean doctrine – which is false and altogether opposed to Holy Scripture – of the motion of the Earth and the immobility of the Sun, which is also taught by Nicolaus Copernicus in *De revolutionibus orbium coelestium*, and by Diego de Zúñiga [in his book] on Job…. Therefore, in order that this opinion may not insinuate itself any further to the prejudice of the Catholic truth, the Holy Congregation has decreed that the said Nicolaus Copernicus, *De revolutionibus orbium*, and Diego de Zúñiga, *On Job*, be suspended until they be corrected; but that

> the book of the Carmelite Father, Paolo Antonio Foscarini, be altogether prohibited and condemned, and that all other works likewise, in which the same is taught, be prohibited, as by this present decree, it prohibits, condemns, and suspends them all respectively.[652]

The phrase, "and that all other works likewise, in which the same is taught," is ambiguous with respect to whether the decree was referring only to books, like Foscarini's, that taught heliocentrism as a fact but had already been published and thus could not be corrected, or also included works that taught heliocentrism as a fact but had not yet been published and thus could still be corrected. That the latter condition may be included in the decree's intent is noted by the addition of "suspends" to the clause "it prohibits, condemns, and suspends them all respectively," since a single work within the class of "all other works" could not be "suspended" unless there was the intent to allow it to be corrected before being published, which also happened in the case of Copernicus' book. But since this latter possibility is not clearly stated in the decree, the decree could give the impression that even works that taught heliocentrism as a hypothesis would also be prohibited from being published. Since such was not the case due to the fact that the 1758 Index allowed Copernicus and Galileo's works to be published if "properly corrected," then it appears it was best to eliminate the general prohibition but keep the specific prohibition.

The Efforts of Pietro Lazzari to Exonerate Galileo

In any case, the decision to continue the censure of Copernicus, Foscarini, Zúñiga, Kepler and Galileo, became all the more significant in the face of the initial arguments put forth by the Jesuit consultant, Pietro Lazzari, professor of church history at the Roman College, to remove the general prohibition. Lazzari tries to convince the Congregation of the Index by first citing all the modern astronomers who hold to heliocentrism. The pressure his words put upon the Congregation were unprecedented. It seems his objective was to make them appear foolish if they did not accept the heliocentric system as a thesis. He writes:

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[652] Original Latin: "….Et quia etiam ad notitiam praefatae Sacrae Congregationis pervenit, falsam illam doctrinam Pithagoricam, divinaeque Scripturae omnino adversantem, de mobilitate terrae et immobilitate solis, quam Nicolaus Copernicus De revolutionibus orbium coelestium, et Didacus Astunica in Job, etiam docent…. ideo, ne ulterius huiusmodi opinion in perniciem Catholicae veritatis serpat, censuit, dictos Nicolaum Copernicum De revolutionibus orbium, et Didacum Astunica in Job, suspendendos esse, donec corrigantur; librum vero Patris Pauli Antonii Foscarini Carmelitae omnino prohibendum atque damnandum; aliosque omnes libros, partier idem docentes, prohibendos: prout praesenti Decreto omnes respective prohibit, damnat atque suspendit. In quorum fidem praesens Decretum manu et sigillo Illustrissimi et Reverendissimi D. Cardinalis S. Caeciliae, Episcopi Albanensis, signatum et munitum fuit, die 5 Martii 1616" (Antonio Favaro, *Galileo E L'Inquisizione*, p. 63; *Le Opere di Galileo Galilei*, vol. 19, p. 323). Part of above translation taken from de Santillana's *The Crime of Galileo*, as cited by Fantoli in *Galileo: For Copernicanism and For the Church*, pp. 223-4.

> …I now come to the second point and reflection: that not one of these reasons, and still less the whole set, remains nowadays to retain the clause ["all books teaching the earth's motion and the sun's immobility"]. First, then, the opinion of the earth's motion is prevalent in the principal academies, even in Italy, and among them most celebrated and competent physicists and mathematicians. Second, they explain Scripture in the sense that is proper and most literal. Third, they advance a kind of demonstration in their favor.
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> ….Soon after our decree or thereabouts [1633], this opinion [of heliocentrism] began to get established, mostly through the work of Kepler…Bacon of Verulam also said…that in his time the opinion was beginning to spread and expand. In book 1 of *Kosmotheoros*, Christiaan Huygens asserted: "Nowadays all astronomers, except those who are of a retarded mind or whose beliefs are subject to the will of men, accept without doubt the motion of the earth and its location among the planets."[653] This is even more true today after the discoveries of Newton or those made with the benefit of his system. It is enough to read the proceedings and journals of academies, even Catholic ones, and the works of the most celebrated philosophers and mathematicians, or even dictionaries and similar books that report on the most widely accepted opinions. And indeed, in the article on Copernicus in the *Encyclopedia, or Reasoned Dictionary of the Sciences*, the famous mathematician D'Alembert writes: "Nowadays this system is generally followed in France and England, especially after Descartes and Newton each tried to confirm it by means of physical explanations….It would be desirable that a country as full of intelligence and learning as Italy recognize an error so harmful to scientific progress and that she think of this subject as we do in France!

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[653] *Kosmotheoros, sive de Terris Coelestibus, Earumque Ornatu, Conjecturae*, 1698, Hagae Comitum, p. 14.

> Such a change would be worthy of the enlightened pontiff who governs the Church nowadays. Friend of the sciences and himself a scholar, he ought to legislate to the inquisitors on this subject, as he has already done for more important subjects….In France one supports the Copernican system without fear…."[654]

To put as much pressure on the Congregation of the Index as he could muster, Lazzari adds an arsenal of heliocentric supporters, quoting from the 1749 *Chambers's Universal Dictionary*: "According to the Copernican hypothesis, which now seems generally accepted and even has a demonstration [Bradley's stellar aberration] the sun is at the center of the system of planets…and our earth among them revolve around it in different periods…" and the 1750 *Philosophical Grammar of the Sciences*, which, speaking of geocentrism, says: "We have not reason to believe it; instead we have some demonstrations to the contrary." He cites Fr. Paolo Frisi's *Dissertation on the Diurnal Motion of the Earth*, which was granted an "imprimatur of the general of his order; and it was signed 'Rome, at the ex college of Saints Blaise and Charles, 24 January 1756' and was based on the reports of two of his theologians." He continues:

> Here in Rome itself we can find that this is true. I have frequently had occasion to speak with the two celebrated mathematicians of the order of St. Francis of Paola, with Fathers Boscovich and Maire….I can attest that this is also their opinion. And the said Father Boscovich, who has tried to reconcile the

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[654] Jean D'Alembert, *Copernic*, in Diderot and D'Alembert 1751-1780, 4, pp. 173-174, as cited in *Retrying Galileo*, pp. 142-143. We note here that Lazzari's quote of D'Alembert is only a few years prior to the French Revolution of 1789, which precipitated an almost total rejection of Church authority in France. As Finocchiaro describes it: "The French Revolution affected the Galileo affair not only in the general and indirect ways…but also in a very specific and concrete way….In 1798 a French army occupied Rome, abolished the papal government, and established a Roman Republic. Pope Pius VI was deported to Florence, and the Inquisition palace in Rome was 'plundered to some extent by a French military rabble, and a part of the archives burned.' In 1800 a new pope, Pius VII, was elected in Venice, and in 1806 he was allowed to return to Rome with limited powers of government….In 1809, Napoleon again abolished papal government in Rome; the pope responded by excommunicating him. As a result, the pope was arrested and deported to France, and on 2 February 1810 everything in Rome pertaining to papal government was ordered moved to France. This situation did not change until 1814, when Napoleon freed the pope, restored the papal state, and began returning Church records and archives to Rome" (*Retrying Galileo*, pp. 175-176).

> modern discoveries with the earth's rest, has told me several times that he regards his reconciliation and the earth's rest most improbable from the point of view of pure natural reason, and that to believe this it is necessary to bind the intellect in deference to Faith.

Lazzari adds the 1743 *Institutions of Physics*, wherein the famous Madame du Châtelet says: "The insuperable difficulties of the consequences drawn from it induced Copernicus to abandon it entirely and adopt the contrary hypothesis, which corresponds so well to the phenomena that now its certainty is not far from demonstration," and Keill's *Introduction to True Physics and Astronomy*, stating: "Induced by these indubitable reasons, we brought the earth into heaven, placed it among the planets, and thrust the sun down to the center." Lazzari adds "Bradley's letter to Halley on the aberration of fixed stars and chapter 3 of book 3 of MacLaurin's *Account of Sir Isaac Newton's Philosophical Discoveries*. And there is a great multitude of others who speak in a similar or more striking vein." Lazzari, hoping to persuade the Congregation of the Index by subtle suggestions of its ineptitude if it doesn't accept heliocentrism, then says:

> …it is expedient in the present situation for the Index to remove that clause….To retain it does no good….Who among young people studying mathematics does not read Wolff's *Elements*? Varenius's *Geography*? The *Introduction* of Keill, of Musschenbroek, and of Madame du Châtelet? Who does not consult Chambers's *Dictionary*? All these books mentioned so far have been republished in Italy; all are found in every bookshop of average stock; all are sold, bought, and lent. Who does not want to be informed about Newton's system or does not have available the book of some Newtonian?....Shall we ensure that some qualification be inserted every few pages, using that single word 'hypothesis' as a panacea?....Protestants are very deeply convinced of the falsity of the system of the motionless earth and of the existence to demonstrations to the contrary…with the intention of showing that in Rome there is the greatest ignorance of the most well known things or the blindest obstinacy. And so they exploit it…in connection with other points regarding either the interpretation of Scripture, or the definition of dogmas, or the understanding of Church Fathers….Thus, why should we not prevent them from doing so, and take away from them such a powerful weapon?

Lazzari also marginalizes geocentrists as those who "now deny the system of the moving earth with the most fervor and commitment are either strange in their other opinions, or barely educated in their basic elements of geometry and mechanics," while citing what he believes are the various proofs of heliocentrism: "To name a few items, such are the laws of the aberrations of the moon…the motion of fixed stars, called aberration of starlight; the nutation of the equatorial axis; the laws of the tides; the motions of comets; *etc.*," all of which, we might add, have been shown by modern science to be totally inept at proving heliocentrism.

Lazzari also tried his hand at convincing the Congregation of the Index by an appeal to the proper interpretation of Scripture based on two ways of viewing motion, claiming that "the defenders of the Copernican system…believe that while defending such a system they can keep a sense that is more proper and natural than any other." His argument is:

> We must distinguish two kinds of motion and rest. The first is absolute; involves what is called imaginary space; and is not subject to any sensation. The other is relative to the bodies that are involved and that determine location, which is also called relative. Thus, when a ship is in motion, whoever is sitting astern moves with absolute motion and stands still at rest relative to the ship. Now, absolute motion is the one that is the subject of the reflection of philosophers since it is not possible to apprehend it with any sensation; relative motion is the only one that is the subject of common sense. Thus, civil society has coined the words "motion" and "rest" to express, in accordance with the common usage of words, relative motion and relative rest. And in accordance with this common manner of speaking, this meaning is not improper but really most proper….Thus, if Sacred Scripture is construed in this manner when it speaks of the motion of the sun and the rest of the earth, namely as meaning relative motion and rest, in relation to us and the place where we are, exactly as in that ship, then I am construing it in a sense that is proper, obvious, natural, and in harmony with the common definition of words.

Quite ingeniously, Lazzari then refers to the same argument to which many appeal today – the "center of mass" discovered by Newton:

> For in truth modern philosophers and astronomers do not regard it [the sun] as immobile at all, as they did; that is, they supposed its center to be immobile, and at most supposed it only moving around its own axis. After Newton, the moderns generally regard

> as immobile only the common center of gravity of the sun and all planets and comets; and they think that the sun as well as the earth and the planets turn around this center, although the sun has such a greater mass and is so much closer to the said center that it moves much less than all the other planets. But there is no need to linger on this….That is, nowadays the principle foundation of the prohibition [“all books teaching the earth's motion and the sun's immobility”] no longer subsists…”

As we know today, Lazzari's arguments advocating Newton's “common center of gravity” cannot be used to support heliocentrism. As noted in Volume I of *Galileo Was Wrong: The Church Was Right*, modern astronomy now holds that the sun and Earth are not isolated bodies in the universe; rather, at the least, the sun is pulled by the gravity of the Milky Way and thus revolves around the galaxy's center in order to escape its gravity. Since these stars, which are thousands of light-years away, duly affect our solar system with such strong force, it has become naive and specious for anyone nowadays to insist that we are required to limit ourselves to the two-body system of the sun and the Earth in order to determine what revolves around what. In short, it can no longer be claimed that heliocentrism is proven by Newton's laws of motion. From the perspective of the entire universe, the center of mass depends on far more than the sun and the Earth. According to Newton himself, if the universe's masses are properly distributed, the Earth itself could serve as the center of mass.[655] Indeed, for the Earth to be the center of mass, it alone would be stationary among all the celestial bodies, for according to Newton, the center of mass for the universe must be motionless.[656] Unfortunately, scientists of Lazzari's time were adept at playing the 'Newton card' to silence geocentrists, but as it turns out, it is not a trump card but only a joker that deceived many into thinking that Galileo was right. Indeed, if there ever existed a scientific discovery that backfired on its proponents, this was it. As modern cosmologist Fred Hoyle admits:

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[655] “That the center of the system of the world is immovable. This is acknowledged by all, although some contend that the Earth, others that the sun, is fixed in that center” (*Philosophiae Naturalis Principia Mathematica*, Book 3: The System of the World, Proposition X, Hypothesis I). The Latin original is: Centrum systematis mundane quiescere. Hoc ab omnibus consessum est, dum aliqui terram, alii solem in centro systematis quiescere contendant. Videamus quid inde sequatur.”

[656] In Proposition XI, Theorema XI, Newton adds: “That the common center of gravity of the Earth, the sun, and all the planets, is immovable. For that center either is at rest or moves uniformly forwards in a right line; but if that center moved, the center of the world would move also, against the Hypothesis.” Original Latin is: Commune centrum gravitates terræ, solis & planetarum omnium quiescere. Nam centrum illud (per legum corol. iv) vel quiescent vel progredietur uniformiter in directum. Sed centro illo semper progrediente centrum mundi quoque movebitur contra hypothesin. See Chapters 3, 6, 9 in Volume I of *Galileo*

> Although in the nineteenth century this argument was believed to be a satisfactory justification of the heliocentric theory, one found causes for disquiet if one looked into it a little more carefully. When we seek to improve on the accuracy of calculation by including mutual gravitational interactions between planets, we find – again in order to calculate correctly – that the center of the solar system must be placed at an abstract point known as the "center of mass," which is displaced quite appreciably from the center of the Sun. And if we imagine a star to pass moderately close to the solar system, in order to calculate the perturbing effect correctly, again using the inverse-square rule, it could be essential to use a "center of mass" which included the star. The "center" in this case would lie even farther away from the center of the Sun. It appears, then, that the "center" to be used for any set of bodies depends on the way in which the local system is considered to be isolated from the universe as a whole. If a new body is added to the set from outside, or if a body is taken away, the "center" changes.[657]

Lazzari's argument that we are to understand Scripture's description of the sun's motion and the Earth's rest as "relative motion" and "relative rest," respectively, is also specious. It is the classic error of begging-the-question, for it believes, based presumptuously upon Newton's laws, that heliocentrism is correct, and thus feels justified in making relative all motion or rest recorded in the narratives of Holy Scripture. Galileo did the same. He started with his presumptuous premise, namely, 'the Earth moves,' which then led him to the false conclusion that Scripture's language had to be modified to fit the premise. Thus the syllogism:

- Premise A: The Earth moves.
- Premise B: Scripture says the Earth does not move.
- Conclusion: Scripture is speaking in relative or metaphorical terms.

Was Wrong: The Church Was Right for further study on Newton's laws and their relation to geocentrism.

[657] Fred Hoyle, *Nicolaus Copernicus*, 1973, p. 85.

Of course, no one had proven that Premise A was correct, thus the Conclusion of Lazzari's syllogism was invalid. Conversely, basing one's syllogism on the inerrancy of Scripture and the missing proofs of modern science, the proper format would be:

- Premise A: Scripture says the Earth is not in motion.
- Premise B: Modern science has not proven that the Earth moves.
- Conclusion: The Earth does not move.

In retrospect, Scripture and the common man of biblical times were certainly aware of the difference between relative motion and absolute motion. It is not a hard concept to understand or an experience that is remote from every day living. Geometrically speaking, if there is no fixed center among things that move, then everything, to some degree, is in motion. But this is precisely why the Fathers fought for a fixed Earth. It gave a stable and dependable reference point for everything in the universe, both spiritual and physical. Once man knows he is in the very center of things, everything is within his grasp. As physicist Amitabha Ghosh admits: "As long as terre firma had its immobile status…there was no problem. All motions were with respect to the Earth, just as we observe. The difficulty started once the firm ground was lost."[658]

Lazzari also appeals to various and sundry beliefs in Catholic history that were later discovered to be in error:

> Nor is it relevant to say that here one is dealing with the interpretation of Scripture and an opinion considered to be against the Faith. It would be unfortunate if, whenever there has been a consensus in the past, we try now to maintain the old shared opinions. Once it was a common opinion, which was supported by citing Scripture, that the heavens were moved by intelligent beings. Thus at about the same time, in paragraph 4 of book 2 of his *Philosophical Course*, Cardinal Sfondrati said: "It was and is the opinion of almost all philosophers and theologians that the heavens are moved by intelligent beings." In question 6

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[658] Amitabha Ghosh, *Origin of Inertia: Extended Mach's Principle and Cosmological Consequences*, Montreal, Apeiron, 2000, p. 7.

> of article 3 of *De Potentia*, St. Thomas says that it belongs to the Faith.[659]

Lazzari's desperate attempt to cast a cloud over the Church's geocentric tradition is fatuous. Although the idea that angels moved the heavenly bodies was discussed in and out of the patristic and medieval eras, there was no consensus among either group that it was a reality. In fact, in *De Potentia* 6, 3, Aquinas quotes Augustine from *De Trinitatae* 2, 10, saying: "How angels do these things, or rather how God does them through his angels, my sight is not keen enough to see, my reason too diffident to unravel, my mind too slow to grasp; nor can I answer with assurance all the queries that could be made on this matter…" Aquinas himself makes no firm conclusion, but only says: "Although an angel *may cause* the movement of the heavens…"[660] In reality, the whole purpose of *De Potentia* 6, 3 was to refute the ideas that angels could perform miracles at will without limitation. In other sections of *De Potentia*, Aquinas shows us his understanding of movement by natural causes: "Although the local movements of the lower bodies as well as other movements are brought about by certain fixed natural causes…"[661] As for Scripture, there exists no passage which states that angels move the heavenly bodies. The most that could be gleaned from Scripture is that angels can exercise extraordinary powers in the temporal realm. Conversely, Scripture is replete with passages that specify the Earth is at rest and the sun moves. Secondly, the patristic and medieval eras give testimony of an absolute consensus to the doctrine of a fixed Earth and a moving sun, whereas no such consensus exists regarding angelic forces moving celestial bodies. Thirdly, geocentrism was confirmed by the magisteriums under several pontiffs, pontiffs that guided and approved the process of condemning Copernicanism from start to finish, whereas an angelic impetus for the heavenly bodies did not even come up for discussion within magisterial ranks.

Consequently, after all the pressure Lazzari brought to bear on the Congregation of the Index, in the final tally, although the 1758 decision excised the "all books" prohibition, none of Lazzari's arguments convinced the Congregation to lift the ban on Copernicus, Foscarini,

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[659] All quotes from Lazzari's letter taken from Ugo Baldini's *Saggi sulla cultura della Compagnia di Gesù*, Padua: Cooperativa Editrice Libraria Università di Padova, 2000, pp. 489v-491v, as cited in *Retrying Galileo*, pp. 139-151.

[660] "Ad quintum dicendum, quod Angelus etsi caelum moveat…" (*De potentia*, q. 6 a. 3 ad 5).

[661] "Ad undecimum dicendum, quod licet motus locales inferiorum corporum sint a determinatis motoribus naturalibus…" (*De potentia*, q. 6 a. 3 ad 11).

Zúñiga, Kepler or Galileo, or to consider heliocentrism as more than a hypothesis. No permission was granted that Copernicus' model could be published without the previously required "proper corrections."

The Rebuff to Astronomer Joseph Lalande

The solidity of Benedict XIV's 1758 approval of the acts of the Sacred Congregation in continuing the ban on Copernicanism was confirmed with legal overtones when French astronomer, Joseph Lalande, while visiting Rome in 1765, attempted to have Galileo's *Dialogo* taken off the Index by Lalande's citing the fact that the 1758 Index had withdrawn the general ban on books about Copernican cosmology. The head of the Congregation of the Index promptly told Lalande that since the prohibition against Galileo and his *Dialogo* was precipitated by a canonical trial, the sentence pronounced against Galileo would first have to be revoked in order for any lifting of the prohibition to occur.[662]

The importance of this canonical protocol cannot be underestimated. If the head of the Congregation of the Index indeed spoke truthfully for the Church on this matter, he informs us in no uncertain terms that for any rehabilitation of either Galileo or his heliocentric theory to occur, a formal and legal reversal of his sentence and condemnation would first have to take place, either by the then present magisterium or any future magisterium. If there is no subsequent formal and legal exoneration of Galileo, then, according to the canonical protocol of the Catholic Church, Galileo and his heliocentric theory remain condemned to this very day. Since the Church has not initiated any official, formal or legal rescission of Galileo's condemnation, it remains legally in force.

The Disclaimer on Isaac Newton's *Principia Mathematica*

Lalande and Lazzari represented a contingent of scholars who were advancing the theories of Isaac Newton to support heliocentrism. But there was an equally strong force against succumbing to the Newton factor. Isaac Newton, who, coincidentally was born in the same year Galileo died, 1642, published his famous work titled *Principia Mathematica* forty-five years later in 1687. It was, and is now, the most famous book ever written on physics and mathematics. It was the *Principia* that single-handedly gave geocentrism its most difficult challenge, since, apparently, Newton's laws of motion: (a) required the sun to be larger than the Earth, and (b) required the smaller body to revolve around the larger body. As we noted previously, Newton's laws actually stated that both the smaller and the larger body revolved around the center of mass that was located somewhere between the two bodies, but since the distance of the center of mass between the Earth and the sun was near the center of the sun, in all practicality, Newton's book was well on its way to convincing the world that heliocentrism could be the only possible answer to the question of celestial revolutions.

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[662] As stated verbatim by Finocchiaro in *Retrying Galileo*, p. 154, with citation to Lalande's 1764 work, *Astronomie*, second edition, vol. 1, pp. 536-41, ¶¶ 1103-4. Also cited in Karl Gebler's *Galileo and the Roman Curia*, 1879, p. 313, and Walter Brandmüller's *Galilei e la Chiesa, ossia il diritto di errare*, 1992, p. 162.

But Newton's *Principia* had formidable competition from the Catholic Church. In 1739-1742, when the three-volume edition of the *Principia* was published in Geneva, the Catholic Church apparently had enough power to assign two Minim friars from the Franciscan order, Thomas Le Seur and François Jacquier as editors (although they are commonly mistaken for Jesuits). Their editing of the *Principia* was for the purpose of introducing Newton's work to the educated class of the Roman papal court. As one author judged their edition:

> With its rich editorial content, extensive summaries and detailed index, the Jesuit edition remains the most ambitious and perhaps the most useful edition ever published. It was reissued in Geneva in 1760, Prague in 1780-85, and finally in Glasgow in 1822 and 1833, with further changes by J. M. F. Wright.[663]

The most significant feature of the above editions of the *Principia* in light of the heliocentric/geocentric debate was that the Preface contained a disclaimer, or what was then known as a "Declaratio," stating that although Newton assumed the heliocentric system to be true, this was not the belief of the editors, Le Seur and Jacquier, who represented the Catholic Church. Hence, each reader of the *Principia* would understand that although the editors wrote as if they accepted Newton's heliocentrism, they did not, in fact, agree with it at all. All the editions carried this wording:

> Newton in his third book assumes the hypothesis of the earth's movement. The author's propositions could not be explained except on the same hypothesis. Hence we have been obliged to put on a character not our own. But we profess obedience to the

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[663] *Isaac Newton and the Scientific Revolution*, an exhibition of books from Dr. and Mrs. R. Ted Steinbock, Moutain Goat Press, Louisville KT, 2006.

> decrees made by the Supreme Pontiffs against the movement of the earth.[664]

This is quite a statement. The Pontiff reigning at the time was Benedict XIV, the same pontiff that eventually gave approval to remove the prohibitory sentence ["all books teaching the earth's motion and the sun's immobility"] from the *Index*. Hence, whatever allowance he had given to science in 1742 and 1758 it certainly was not to be interpreted as supporting the heliocentric system. In fact, we take strict notice that Le Seur and Jacquier did not attribute the "decrees…against the movement of the earth" as coming merely from "theologians" or even cardinals in high places, but from the "Supreme Pontiffs" up to their own day. Their specific use of the plural "Pontiffs" recognizes all the previous popes whom they understood as holding the same truth as Benedict XIV. All of them, without exception, had condemned the notion of a moving Earth. As editors under the Church and her authority as Minim friars, Le Seur and Jacquier would never have been able to attribute the rejection of heliocentrism to all the "Supreme Pontiffs" unless they were permitted to do so by those very popes; and unless the consensus of allegiance to the pope on this matter was pervasive throughout the continents under her control. If the Church had disagreed with the disclaimer and had decided by 1739 to accommodate cosmologies other than geocentrism, the disclaimer would have been removed since the disclaimer is making the bold and well publicized proclamation that all the "Supreme Pontiffs" have rejected Newton's heliocentrism. In 1739, when Jaquier and Le Suer first published their commentary, the Index against heliocentrism was alive and well, as noted by the fact that Benedict XIV kept Copernicus, Galileo and Kepler on the Index in 1741 and 1758. If Jaquier and Le Suer had promoted Newton's heliocentrism, they would have been put on the Index as well.

Interestingly enough, Pietro Lazzari, noted earlier for his long letter seeking to convince the Inquisition in favor of Copernicanism in 1741, mentions Le Seur and Jacquier in his letter as "two celebrated mathematicians of the order of St. Francis of Paola"[665] and he attempts to use them as corroborating testimony of the position that "nowadays the prevalent opinion among the most competent astronomers and physicists is that the earth moves around the sun." Hence, either Lazzari did not know of Le Seur and Jacquier's devotion to geocentrism, or he was purposely distorting the truth.

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[664] *Philosophiæ Naturalis Principia Mathematica*, Isacco Newtono, PP. Thomæ Le Seur & Francisci Jacquier, Genevæ, MDCCXXXIX [1739]. Original Latin: "DECLARATIO: Newtonus in hoc tertio Libro Telluris motæ hypothesim assumit. Autoris Propositiones aliter explicari non poterant, nisi eâdem quoquè factâ hypothesi. Hinc alienam coacti sumus gerere personam. Cæterum latis a summis Pontificibus contra Telluris motum Decretis nos obsequi profitemur." Above translation taken from Rev. William W. Roberts in *The Pontifical Decrees Against the Doctrine of the Earth's Movement*, p. 53.

The most significant aspect of the *Declaratio* was that it persisted in all Latin volumes of the *Principia* for the next hundred years. The last volume on record to contain Le Seur and Jacquier's disclaimer was the 1833 Glasgow (or Glasguæ) edition, two years before the Index of Gregory XVI (see facsimiles above). This late date (1833) proves once again that the Pontiffs of the Catholic Church were the main authorities against the heliocentric system. By 1833, Newton was a household word and anyone worth his scientific salt had read his book and most likely agreed with it, at least in principle. That his book still contained the *Declaratio* in 1833 meant that the Catholic Church still believed in geocentrism and, consequently, the imprimatur granted to Settele in 1822 really had no effect on that consensus. Unfortunately, these facts were not added to the 1992 speech of John Paul II.

The relevant pages of the 1739-1742 editions of Newton's *Principia* are on display on the next page:

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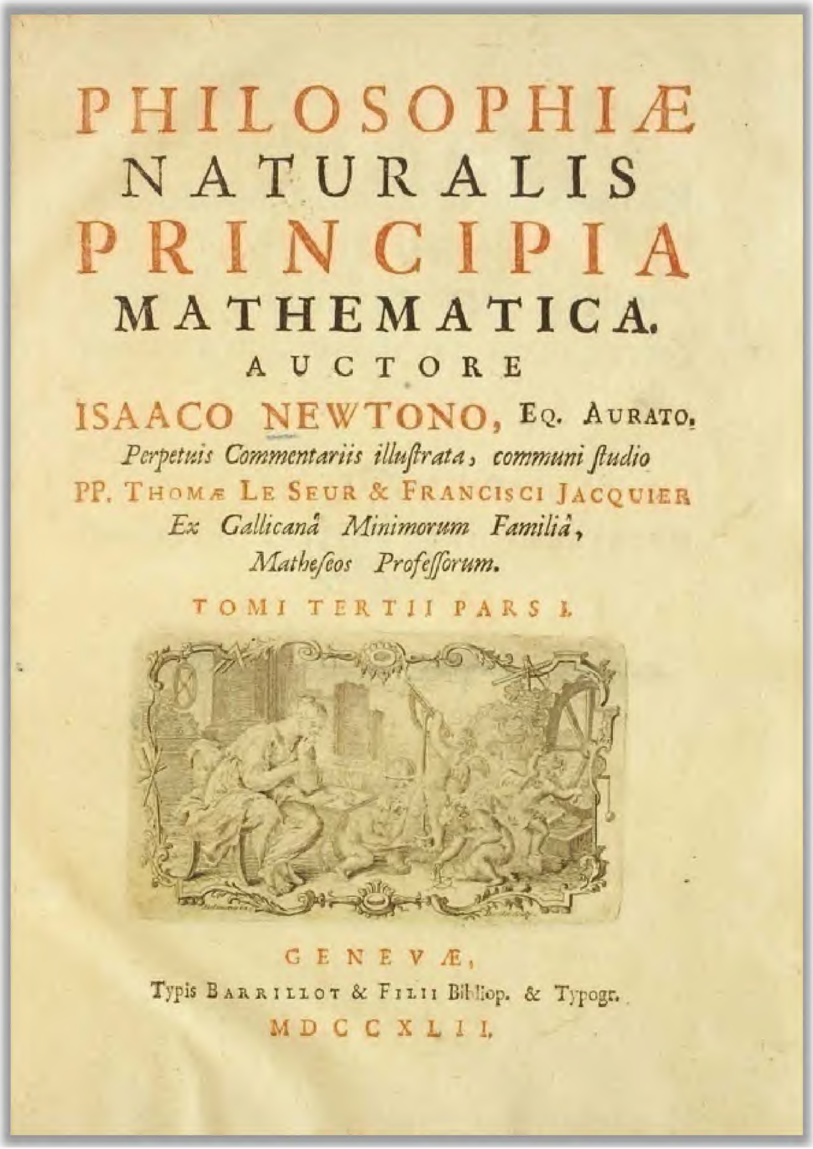
[665] As cited in Finocchiaro's *Retrying Galileo*, p. 143, with an endnote identifying them as: "The Minim Fathers François Jacquier (professor of experimental physics at the University of Rome from 1746) and Thomas Le Seur (professor of applied mathematics from 1749)…They were the coeditors of the famous edition of and commentary to Newton's *Principia* in 1739-1742" (*ibid.*, p. 394), yet neither Finocchiaro nor his alternate source, Baldini, mention that Jacquier and Le Seur disavowed themselves from Newton's heliocentrism and gave their full allegiance to the pontiffs who condemned Copernicanism.



PHILOSOPHIÆ
NATURALIS
PRINCIPIA
MATHEMATICA.
AUCTORE
ISAACO NEWTONO, EQ. AURATO.
Perpetuis Commentariis illuſtrata, communi ſtudio
PP. THOMÆ LE SEUR & FRANCISCI JACQUIER
Ex Gallicanâ Minimorum Familiâ,
Matheſeos Profeſſorum.
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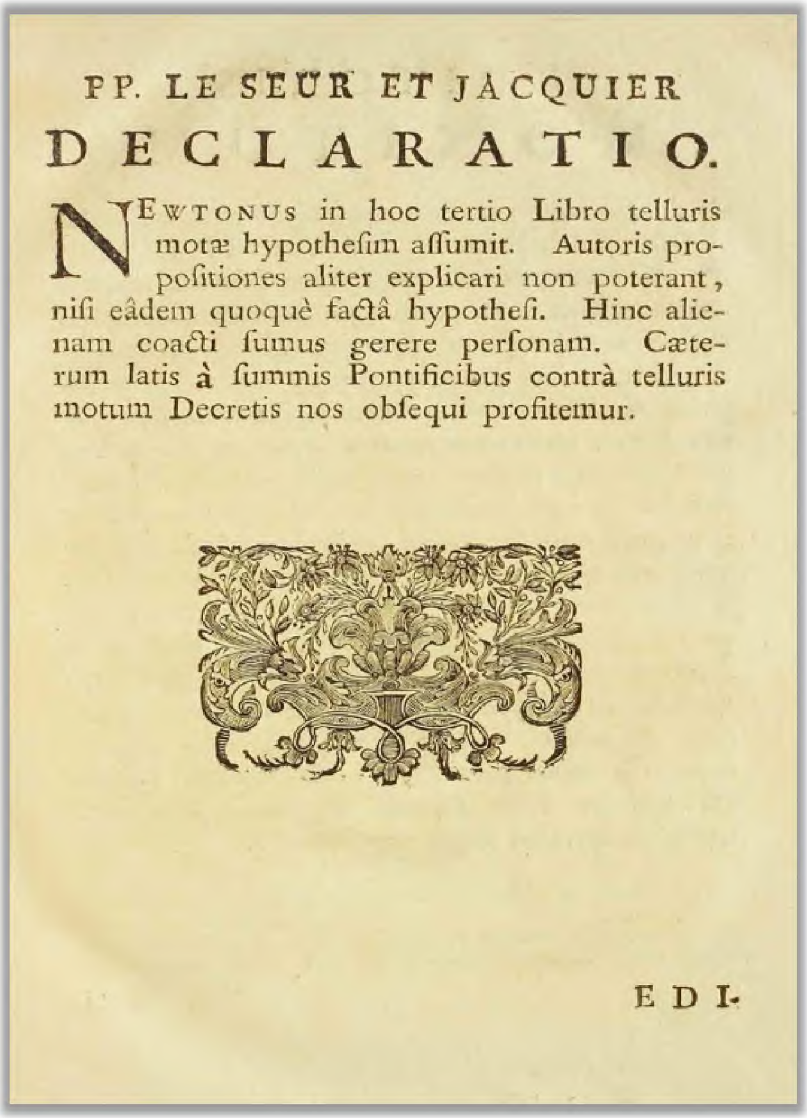

PP. LE SEUR ET JACQUIER

DECLARATIO.

NEWTONUS in hoc tertio Libro telluris motæ hypotheſim aſſumit. Autoris propoſitiones aliter explicari non poterant, niſi eâdem quoquè factâ hypotheſi. Hinc alienam coacti ſumus gerere perſonam. Cæterum latis à ſummis Pontificibus contrà telluris motum Decretis nos obſequi profitemur.

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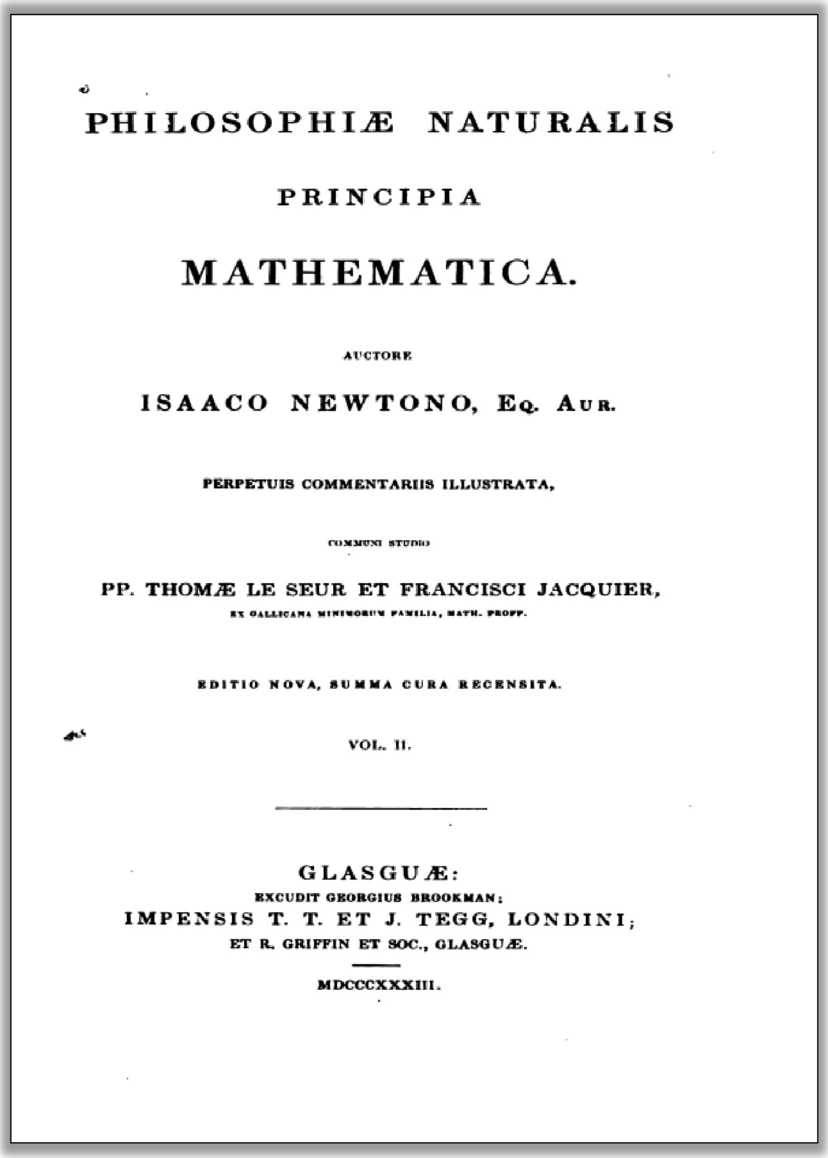


PHILOSOPHIÆ NATURALIS

PRINCIPIA

MATHEMATICA.

AUCTORE

ISAACO NEWTONO, EQ. AUR.

PERPETUIS COMMENTARIIS ILLUSTRATA,

COMMUNI STUDIO

PP. THOMÆ LE SEUR ET FRANCISCI JACQUIER,

EX GALLICANA MINIMORUM FAMILIA, MATH. PROFF.

EDITIO NOVA, SUMMA CURA RECENSITA.

VOL. II.

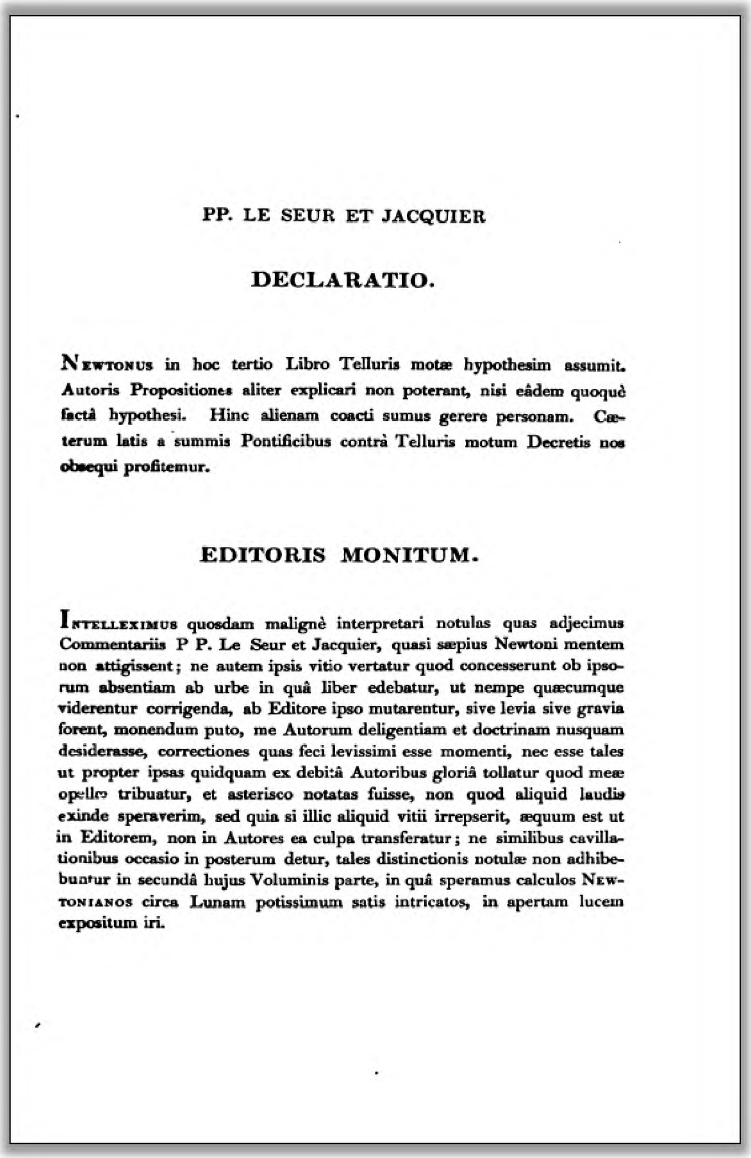
GLASGUÆ:

EXCUDIT GEORGIUS BROOKMAN;

IMPENSIS T. T. ET J. TEGG, LONDINI;

ET R. GRIFFIN ET SOC., GLASGUÆ.

MDCCCXXXIII.



PP. LE SEUR ET JACQUIER

DECLARATIO.

Newtonus in hoc tertio Libro Telluris motæ hypothesim assumit. Autoris Propositiones aliter explicari non poterant, nisi eâdem quoquè factâ hypothesi. Hinc alienam coacti sumus gerere personam. Cæterum latis a summis Pontificibus contrà Telluris motum Decretis nos obsequi profitemur.

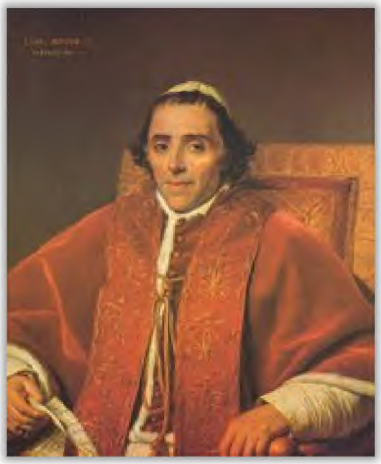
EDITORIS MONITUM.

Intelleximus quosdam malignè interpretari notulas quas adjecimus Commentariis P P. Le Seur et Jacquier, quasi sæpius Newtoni mentem non attigissent; ne autem ipsis vitio vertatur quod concesserunt ob ipsorum absentiam ab urbe in quâ liber edebatur, ut nempe quæcumque viderentur corrigenda, ab Editore ipso mutarentur, sive levia sive gravia forent, monendum puto, me Autorum deligentiam et doctrinam nusquam desiderasse, correctiones quas feci levissimi esse momenti, nec esse tales ut propter ipsas quidquam ex debitâ Autoribus gloriâ tollatur quod meæ opellæ tribuatur, et asterisco notatas fuisse, non quod aliquid laudis exinde speraverim, sed quia si illic aliquid vitii irrepserit, æquum est ut in Editorem, non in Autores ea culpa transferatur; ne similibus cavillationibus occasio in posterum detur, tales distinctionis notulæ non adhibebuntur in secundâ hujus Voluminis parte, in quâ speramus calculos Newtonianos circa Lunam potissimum satis intricatos, in apertam lucem expositum iri.

These matters are quite sobering. If we consider that in the present day we are less than 180 years from the publication of the last *Declaratio* on Newton's *Principia* (the most formidable defense of heliocentrism up to that time) it means that any belief in heliocentrism in Catholic society today is virtually in its infancy. As we noted in Volume I, during this 180-year period (1833-2013) some of the most sophisticated scientific experiments ever performed demonstrated that the Earth was standing still in space. Already in 1818 the stage was being prepared. Dominique Arago tested the refraction of starlight and found that regardless how he adjusted his apparatus the results always showed the Earth was at rest. Augustin Fresnel and Armand Fizeau tried in vain to upset his results since they knew of and rejected its geocentric implications. The same results were again confirmed by an even more sophisticated experiment performed by George Airy in 1871. The final nail in the coffin came from the Michelson-Morley experiment of 1887, and all similar interferometer experiments performed through 1932. They all gave the same results – the Earth was standing still in space. After 1932, equipment with even more precision, masers and lasers, were employed, but the same results persisted.

The upshot of the foregoing history is, while the Catholic Church was maintaining its belief in geocentrism by the unwavering edicts of its "Supreme Pontiffs" through 1833, whatever winds of change Newton and his followers were brewing toward heliocentrism by their new theories of gravity and motion were just as quickly being corralled into support for geocentrism by the hands-on experimental evidence of Arago, Airy, and Michelson. It was as if God was giving the Church and the world all the evidence they needed against Newton in the 180-year interim after the 1833 *Declaratio* to maintain the course in geocentric cosmology. The only way the powers-that-be could fool the world into thinking that they could escape this glaring evidence was to reinvent physical science, which is precisely what occurred in the theories of Albert Einstein in 1905, a scientist, we might add, that had a deep antipathy for the Catholic Church and anything religious (see Chapter 13, Vol. II). This is precisely why Einstein is considered one of the greatest scientists ever known. He saved the world from having to turn the clock back and submit itself to the medieval Catholic Church in all its power and glory. If Einstein failed, which would mean that the Catholic Church had been right all along about Galileo, we can imagine what a different world this would be. Einstein knew what he was up against for it is more or less admitted in the way he chose to esteem Galileo, as a man who, in his own words, led "the passionate fight against any kind of dogma based on authority." According to Einstein, Galileo's *Dialogo*, the very book that was condemned by the Catholic Church, had "revolutionary factual content." He applauds Galileo for standing up against "the host of those" who relied "on the ignorance of the people and the indolence of teachers in priest's and scholar's garb" in order to "maintain and defend their positions of authority," namely, the Catholic Church.[666] Actually, as we have seen, Galileo did no such thing. Einstein and the rest of modern science have merely created a convenient myth about Galileo. Galileo did not rebel against the authority of the Catholic Church. When he was convicted of being suspect of heresy, he abjured, and eight years later, one year before his death, he totally rejected Einstein's universe.

Pius VII and Canon Settele's Imprimatur



As the 1833 *Declaratio* on Newton's *Principia* shows that the history of papal decisions from 1616 onward had a significant effect on what faithful Catholics believed, conversely, the 1820 imprimatur given to Canon Giuseppe Settele was a classic case of hierarchial subterfuge. It was conducted by Maurizio Benedetto Olivieri who had advanced to the position of Commissary General of the Index. In 1806 Settele had already published a book in Rome espousing heliocentrism. The Master of the Sacred Palace[667] at that time was Pani, who did nothing to stop Settele.[668]

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[666] All quotes taken from I. Bernard Cohen's *Revolution in Science*, p. 439.

[667] Mayaud defines the position: "The function of the Master of the Sacred Palace traces back to St. Dominic. At first it consisted in instructing the court and attendants of the pope and of the cardinals in the Christian truths. Then, with the Bull "Licet ubilibet ad seminandum verbum dominicum" of 1456, the Master of the Sacred Palace was in charge of the preliminary censorship of sermons given in the pontifical chapel during Advent and Lent, in order to avoid any error of the

Fr. Filippo Anfossi became the Master of the Sacred Palace in 1814 and was not favorable to Copernicanism. Knowing Anfossi's position, Settele asked Giuseppe Calandrelli (an astronomer and claimant to the discovery of stellar parallax as a proof of heliocentrism),[669] and Maurizio Olivieri (his colleague from the Sapienza which held a chair in Astronomy, although Olivieri was not at this time the Commisar of the Holy Office) if one was permitted to speak openly about the Earth moving, and, according to Settele's diary, Olivieri answered affirmatively, thus deciding the case in favor of Settele even before it had been adjudicated,[670] and even though he admitted on June 10, 1820 that "the pope would not be easily persuaded about the truth of the Copernican system."[671] From Settele's diary we also learn that after his second volume of *Elementi di Ottica e di Astronomia* was disapproved on January 3, 1820 by Anfossi because it promoted, as a thesis, that the Earth moved, Settele, under Olivieri's advice, sent a formal appeal to Pius VII in March 1820. At this time Merenda was the Commisary General of the Holy Office until July 1, 1820 when he died, and Olivieri did not become the next Commisar until September 2, 1820. Olivieri's bias toward heliocentrism (from which he "assured him [Settele] several times that this system is evident according to the pope")[672] and his willingness to dispense with the traditional Catholic teaching on geocentrism was apparently too strong for him to recuse himself. In fact, he told Settele: "if the Commissary preceding Merenda had still been alive, my case would have suffered some delay, because he was obstinate in the old things and did not want any novelty."[673]

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lector in the presence of the pope, an error which afterwards might be attributed to the Holy See. In addition to other varied tasks, to which he is assigned, he is in some way the theologian of the pope, an office which continues to the present day." (Pierre-Noël Mayaud, SJ, *The Condemnation of Copernican Books and Its Repeal*, 1997, Introduction).

[668] As noted by Mayaud, *Condemnation*, p. 236.

[669] Giuseppe Calandrelli (1749 – 1827) served as the astronomer of the former Jesuit Collegio Romano during the period of the suppression of the Society of Jesus. He was a preeminent astronomer in Rome, engaging in work of traditional positional astronomy, including observations of comets and eclipses and accurate measurements of stellar positions and motions.

[670] As noted by Mayaud, *Condemnation*, p. 249. Settele writes in his diary on January 3, 1820: "I have asked P. Olivieri, Professor at the 'Sapienza,' Dominican, and attached to the Inquisition, if I could openly affirm the movement of the earth, and he told me, yes." Settele's diary dates of 1810 through 1836 was collected and published by Paolo Maffei in 1987 as *Giuseppe Settele, il suo Diario e la questione galileiana*, Foligno: Edizioni dell'Arquata.

[671] As cited by Mayaud, *Condemnation* p. 251, from Settele's diary, no date given.

[672] *Ibid*., from Settele's diary of August 12, 1820.

[673] From Settele's diary, date August 8, 1820, per Mayaud, p. 249.

Pius VII ordered an examination of the archives of the 1758 *Index* and, apparently without any discussion, asked Turiozzi to tell Anfossi to give Settele an imprimatur.[674] Anfossi, believing the pope was not well informed about these issues and suspecting he was not getting the full story, withheld the imprimatur, which then pushed Settele to appeal to the pope again in August 1820, which then led the pope to involve the Holy Office. The controversy within the Vatican became public and the Vatican was criticized in the press for not showing favor to Settele. Two weeks later, Father Antonio Grandi moved the Holy Office to tell Anfossi to issue the imprimatur. The notes of the Holy Office of August 16, 1820 stated:

QUARESIMALE
DEL
P. FILIPPO ANFOSSI
PAPA PIO VII.

> And the intention is, that it will be made known to the Reverend Father Master of the Apostolic Sacred Palace, that he should not hinder the publication of the '*Elements*' by the Canon Joseph Settele; also to make know to the Canon Settele, that he should himself insert into his work some remarks in order to show that the Copernican opinion, as presently supported, is not any more subject to these difficulties implied at a former epoch before they were treated afterward.[675]

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[674] Anfossi's *Motivos* are recorded in Brandmüller's *Copernico Galilei E La Chiesa*, pp. 310ff. One interesting detail is recounted by Mayaud (p. 239) regarding the *Acta* notes of the Settele affair. After describing the conflict between Anfossi and Olivieri, the author of the *Acta* mentions a Father Soldati, Secretary of the Holy Congregation from 1800 to 1807, who says that subsequent editions of the *Index* (1768, 1770, 1786, 1806, 1819) should omit the 1758 decree of Benedict XIV concerning the prohibition of all books teaching the immobility of the sun and the movement of the earth, but the author says these Indices are already absent Benedict XIV's decree. This may indicate either sloppiness in record keeping or ambivalence about Benedict XIV's *Index*.

[675] Mayaud, *Condemnation*, p. 243. Original Latin: "Et mens est, ut insinuetur R[everendissi]mo P[atri] Magistro Sacri Palatii Apostolici ne impediat Editionem *Elementorum* Canonici Iosephi Settele; Canonico autem Settele insinuetur ut ipso in opera nonnulla inserat, quibus ostendat sententiam Copernicanam, ut modo defenditur, non amplius iis difficultatibus esse obnoxiam, quibus, ante posteriora observata, antiquis temporibus imiplicabatur." Brandmüller, *Copernico Galilei E La Chiesa*, pp. 297-298.

The Battle between Anfossi and Olivieri

We see by the words "the Copernican opinion, as presently supported, is not any more subject to these difficulties implied at a former epoch before they were treated afterward" that a new and clever rationale was afoot in order to make the heliocentric view acceptable. Anfossi will expose this creation for what it really is – a clever ruse to win the case for Settele. Anfossi resisted and sent the pope his reasons for doing so in his *Motivos*:[676]

Motivo I:

1) He reminds them that Galileo was denounced in 1615 and condemned of being vehemently suspect of heresy in 1633 based on two propositions: 1) the sun is in the center of the world and does not move, which is absurd, false in philosophy, formally heretical, and contrary to Scripture, 2) the earth is not in the center and is not immobile, and does not move daily, which is absurd and false in philosophy, and theologically considered erroneous in faith.
2) That Galileo was told to abandon the teaching on February 25, 1616, but transgressed that order by writing his *Dialogo* and was therefore condemned on June 20, 1633.
3) That Galileo's imprimatur was revoked.

Motivo II: Anfossi says that all this was done under the watchful eye and approval of the Pope.

Motivo III: Anfossi reminds them that Pope Alexander VII placed Copernicus, Kepler, Galileo, Zuniga and Foscarini on the 1664 Index of Forbidden Books:

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[676] As Mayaud notes: "Anfossi explains this longer in August 1820 in the 'Motivi' (Brandmüller, *Copernico Galilei E La Chiesa*, pp. 310-317), which he presents to the pope after the first decrees were promulgated against him by the Holy Office. He now alludes not only to the decrees of the Congregation of the Index of 1616 and 1620 or to those concerning Galilei (the 'precetto', imposed on him, is now also mentioned), while insisting on the fact that the decree of 1620 does allow to speak of the Copernican System only under a hypothetic title…but also and especially with the sense of the suppression of the 'Libri omnes docentes …' in the 'Index' of 1758. Particularly, after having evoked the decree of April 16, 1757, quod, habito verbo cum Sanctissimo, omittatur Decretum…" (pp. 255-256).

> Two decrees of the Congregation of the Index quoted by P. Salvatore Roselli, Volume 2, p. 185, e. 201: It is set forth in the *Index of Prohibited Books* by order of Alexander VII published in 1664 n. 14, in these words: "And whereas it has also come to the knowledge of the said Congregation that the Pythagorean doctrine – which is false and altogether opposed to Holy Scripture – of the motion of the Earth and the immobility of the Sun, which is also taught by Nicolaus Copernicus in *De revolutionibus orbium coelestium*, and by Diego de Zúñiga [in his book] on Job, is now being spread abroad and accepted by many – as may be seen from a certain letter of a Carmelite Father, entitled *Letter of the Rev. Father Paolo Antonio Foscarini, Carmelite, on the Opinion of the Pythagoreans and of Copernicus concerning the Motion of the Earth, and the Stability of the Sun, and the New Pythagorean System of the World, at Naples, Printed by Lazzaro Scorriggio, 1615*; wherein the said Father attempts to show that the aforesaid doctrine of the immobility of the Sun in the center of the world, and of the Earth's motion, is consonant with truth and is not opposed to Holy Scripture. Therefore, in order that this opinion may not insinuate itself any further to the prejudice of the Catholic truth, the Holy Congregation has decreed that the said Nicolaus Copernicus, *De revolutionibus orbium*, and Diego de Zúñiga, *On Job*, be suspended until they be corrected; but that the book of the Carmelite Father, Paolo Antonio Foscarini, be altogether prohibited and condemned, and that all other works likewise, in which the same is taught, be prohibited, as by this present decree, it prohibits, condemns, and suspends them all respectively."
>
> Therefore, the Sacred Congregation understanding that the theory of the movement of the Earth and the immobility of the Sun was spreading and was accepted by many, similar to what happens nowadays, despite the Catholic truth, the Holy Church decided, and the decision was approved by the Pope, to condemn those Books, that teach such an opinion: and now it is demanded that the Sacred Congregation and the Pope authorize Mr. Settele to teach that exact same opinion "Therefore, in order that this opinion may not insinuate itself any further to the prejudice of the Catholic truth…"?

Under Motivo IV: Anfossi gives further wording from Alexander VII and makes an accusation against Settele:

> The decree in the *Index of Forbidden Books* by order of Alexander VII reads thus: "Although the writings of Nicolas Copernicus the noble Astronomer in *de Revolutionibus mundi* were altogether prohibited, the Fathers of the Sacred Congregation of the Index have decreed in this regard, that the principles concerning the position and motion of the earthly body are opposed to Sacred Scripture and its Catholic interpretation, which is hardly to be tolerated by a Christian man; for he did not treat it as a hypothesis, but rather did not doubt to lay it down as though it were utter truth; that not withstanding, because in those writings there are many things for the utility of the State, by general agreement, they have gone over to that opinion, that the work of Copernicus, being published even to this very day, should be permitted, even as it has been permitted, nevertheless those things are to be corrected according to the subject to be emended in those places, namely in which he disputes not hypothetically but rather by positively asserting about the place, and motion of the Earth."
>
> This is how Canon Settele operates with the Master of the Sacred Palace: the consensus of the Father was that this Decree of the Sacred Congregation be fully enforced, and Mr. Settele, is trying to make him believe, by changing a few words, that he was teaching the movement of the Earth around the Sun as a hypothesis, and not as a thesis, wanted to be authorized to teach this "principia Sacred Scripturae ejusque verae et Catholicae interpretation repugnantia, quod in homine Christiano,"[677] and much more in a Canonical "minime tolerandum,"[678] and then teach those theories not as a Hypothesis, which was easier to accept, but as a Thesis?[679]

According to Anfossi, Settele originally presented his book on heliocentrism as a thesis, but when he was confronted by Anfossi, Settele changed various words in the book so that it would be presented as a hypothesis. We will see later that Olivieri ignores this exchange and charts a new way for Settele, which is to present his book neither as a hypothesis nor a thesis. Olivieri will claim that the Church's condemnations against

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[677] "The principles are opposed to Sacred Scripture and its Catholic interpretation; hardly to be tolerated by a Christian man."

[678] "not in the least to be tolerated"

[679] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, pp. 313-314.

Galileo and heliocentrism in the 1600s have nothing to do with Settele's book, and therefore Settele should receive an imprimatur.

Under Motivo V: Anfossi speaks about the superiority of the Tycho Brahe system of cosmology in which Tycho could easily accommodate Scripture by having the planets revolve around the sun while the sun and the moon revolve around the Earth.

Under Motivo VI: Anfossi speaks about Bendict XIV:

> The Decree of Benedict XIV reffered to by Settele in his supplication to the Pope, "In fact, by order of His Holiness, having done research in the Reports of the Index, this was found on May 10, 1757 among the Decrees of the Congretation that 'It should be held with the decision of the most Reverend Lords that the Decree in which all books teaching the immobility of the sun and the mobility of the earth out to be omitted,' on the following day then….the secretary set forth for our most holy lord the aforesaid acts which were approved and confirmed by his holiness." However what has Benedict XIV approved? This 'omittatur Decretum' ["omitted decree"] means that such a decree would not be inserted in the *Index of Forbidden Books*. Has he denied by this, and could he deny, that the teaching of the earth's movement and the immobility of the sun was made pernicious to the Catholic Truth, contrary to the true sense of the Scripture, and unworthy of a Christian? Certainly not! Did he want per chance that, in spite of the, so to say, dishonorable condemnations, with which such teaching has been declared and defined, one would give him free course? Even less! On the contrary, he himself wanted that they should be left on the Index of Forbidden Books, and among them are also the books of Copernicus, Galilei, Zuniga, Foscarini, because they teach the immobility of the sun in the center of the universe and the movement of the earth around it. The fact that Benedict XIV, by just motives known by him [alone], has consented to what should be inserted in the *Index of Forbidden Books*, namely the decree in question, he has not set aside for this.[680]

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[680] Translation by Mayaud into French, p. 256. We translate from French to English. Mayaud does not translate the last line of Anfossi's paragraph, which is "Even Clement XIV and his successors have agreed with the fact that most do not publish the Bull *Coenae*. Has it lost its vigor for this?" The Bull *Coenae* was a papal Bull which contained a collection of censures of excommunication against

Here Anfossi argues that whatever Benedict's motives for leaving out the decree against other heliocentric books, he has shown us by leaving Copernicus, Galilei, Zuniga, Foscarini and Kepler on the *Index* that he has more or less stated what should be included in the *Index*, that is, books teaching heliocentrism as a thesis or as fact. It is our contention, similar to Anfossi's, that Benedict's motive was the same as it was in 1620, that is, only books that treated heliocentrism as a hypothesis could escape the *Index*. Otherwise, it would be sheer duplicity for the pope to allow certain books on heliocentrism to be freely printed for Catholic consumption yet ban others that taught the same thing. It would be especially puzzling since the five banned books all taught heliocentrism as a thesis. Conversely, if Benedict allowed all other books favoring heliocentrism only as hypotheses, there would be no contradiction. For one such as Olivieri, however, who is intent on ram-rodding his presumed fool-proof Kelperian system down the throat of Pius VII, he would have little problem putting Benedict XIV in a duplicitous position. He was smart enough to realize that at some point the modern Church had to break with the traditional Church over this issue, and it would be better to have a precedent set with Benedict XIV in 1758 than to start afresh with Pius VII in 1820.

Modern scholars, such as Mayaud, who look back on Benedict XIV's decision and believe he was allowing heliocentrism as a thesis, must at least fault him for making an "incomplete removal," yet somehow reconcile that the "upholding of the Copernican books, declared prohibited, do not oppose in strict logic the decrees of 1820 and 1822."[681] Mayaud makes the attempt by claiming that the 1758 decree "clearly manifests that the removal of these books is another question, because it was not related in the first sentence of the decree concerning only the books 'treating the movement of the earth and the immobility of the sun

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the perpetrators of various offenses, absolution from which was reserved to the pope. There was a custom of period publication of these censures. The first list of censures of the *Bulla Coenae* appeared in the fourteenth century, and was added to and modified as time went on, until its final revision under Urban VIII in the year 1627, after which it remained practically unchanged till its formal abrogation in the last century. Anfossi is making the argument that perhaps this is the reason that the *Index of Forbidden Books* after Benedict's 1758 *Index*, namely, those issued in 1768, 1770, 1786, 1806, 1819, did not contain Benedict's original wording.

[681] As is the case with Mayaud who says, on perçoit ici dans toute sa profondeur le problem pose par le retrait incomplete de 1757" ("One perceives here in depth the problem coming from the incomplete removal of 1757") and "Mais il reste que le maintien des livres coperniciens nommément prohibés ne s'oppose pas, en stricte logique, aux Décrets de 1820 et 1822" (*Condemnation*, pp. 258-259).

according to the common opinion of modern astronomers."[682] But it seems "logic" would dictate it was most likely not an "incomplete removal" but a confirmation of the 1620 decree disallowing heliocentrism as a thesis, which misreading of the 1758 *Index* as an "incomplete removal" led to the wholesale rejection of the Catholic magisterium of eighteen centuries prior; as well as confirmation of that rejection by concluding that issues regarding cosmology today are "another question" that is now determined by "the common opinion of modern astronomers." In other words, Olivieri and his like-minded clerics have now placed scientific "opinions" above the words of divine revelation and its literal interpretation handed down eighteen centuries prior. It is the story of Jacob and Esau once again. Esau sells his divine birthright for a mess of pottage and his life is never the same. From this point onward the Catholic Church began to crumble until the "opinions" of science would almost completely engulf her.[683]

Anfossi argues against Olivieri from another angle concerning Benedict XIV:

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[682] "…et manifeste clairement que le retrait de ces livres est une autre question parce qu'il n'est pas vise par la première phrase du Décret concernant les seuls livres 'traitant de la mobilité de la terre et de l'immobilité du soleil selon l'opinion commune des astronomes modernes' (*Condemnation*, p. 259).

[683] Case in point: After Paul VI demoted the Pontifical Biblical Commission in 1971 due to its excesses and errors in biblical studies, he addressed the PBC again in March 1974. Here Paul VI "invoked the warning of M. J. Lagrange, probably the most celebrated Catholic exegete of the era of scholars. Père Lagrange, said the Pope, had diagnosed the errors of liberal exegesis as springing from several root causes: 'doctrinal opportunism,' which led many to 'bend the texts according to the fashion of the day'; one-sided research; and 'a narrowly rationalist method' which deliberately refused to accept the supernatural." Paul VI stated: "In order to illustrate this responsibility, and to warn you of the false and deviant paths into which exegesis often runs the risk of being sidetracked, We shall make use of the words of a great master of exegesis, a man outstanding for his critical wisdom, his faith, and his loyalty to the Church: we are referring to Père Lagrange. In 1918 (after having outlined the negative balance-sheet of the various schools of liberal exegesis), he denounced the roots of their failure and weakness in the following causes: doctrinal opportunism, research of a one-sided character, and a narrowly rationalist method. 'From the end of the 18th century,' he wrote, 'Christianity placed itself in the tow of reason; one had to bend the texts according to the fashion of the day. This kind of opportunism inspired the commentaries of the rationalists'" (Fr. Brian Harrison, *Living Tradition*, May 2012, No. 158, p. 9). It was precisely at this time in history ("the end of the 18th century") that men like Settele and Olivieri were "bending texts according to the fashion of the day," namely Copernicanism and Newtonianism.

> It is false that the decrees no longer contain any more power, for they are quoted in the book of the Index in such a manner and with such great prohibition, with which all the other decrees are quoted; and even more, the *Index of the Council of Trent* itself. Therefore it is false that these decrees have been revoked by Benedict XIV, which is the greatest pretext with which he [Olivieri] deceives himself and all the others. Even if they had been revoked (for this, a positive opposite decree would be necessary, which has not been produced nor will ever be produced, because it does not exist) from that moment on, when they have been put back again with all the others 'by order of Pius VII, the Supreme Pontiff'would not have less authority than Benedict XIV; and they have now started to regain their old power.[684]

Under Motivo VII, Anfossi says that the Supreme Pontiff's decrees against heliocentrism are irreformable:

> The irreformability of pontifical decrees. The pontifical decrees, which is the true interpretation of the Scriptures, from which the Faith depends, are irreformable, and the two decrees of 1616 and 1620 regard the interpretation of the Scriptures, and faith, which is clear from their expressions: So they are irreformable: So you cannot do anything contrary to them.[685]

Under Motivo VIII, Anfossi argues:

> …the Holy See is that sacred place where the same is always said and where it never changes its feelings about the interpretation of the Scriptures and the Fathers; and if the doctrine in question is declared and defined once, and then there comes a contrary interpretation that is pernicious to the Catholic truth, it will always be declaring and defining the opposite, as you do now like some ill-wise sophist.[686]

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[684] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, pp. 380-381.

[685] "L'irreformabilita dei Decreti Pontificj. I Pontificj Decreti, ove si tratta della vera intelligenza delle Scritture, de cui depende la Fede, sono irreformabili: ma i due decreti del 1616 e 1620 riguardano l'intelligenza delle Scritture, e la fede, com'è palese dalle loro espressioni: Dunque sono irreformabili: Dunque non può farsene un altro contrario ad essi" (Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 315).

[686] "Il Decoro della S. Sede. La S. Sede è quella *terra felice labii unius*, che dece sempre lo stesso, e mai non muta i suoi sentimenti nella vera intelligenza delle

Under Motivo IX

> It is not permitted for Mr. Professor to teach as a thesis his opinion without serious insult to the Congregation of the Faith and the Popes of that time. The current system of the world, Sacred books of Scripture, the assistance of the Holy Spirit, promised to Saint Peter and his successors that they should not be deceived in the true interpretation of the Scriptures, are now the same that they were in 1616 and in 1620, and will be declared and defined, as we have seen so far.

Anfossi then goes on to say that Settele's opinion cannot withstand the whole history of the Church that interpreted the Scriptures and the Fathers in the exact opposite way of Settele's cosmology. He adds that the Master of the Sacred Palace has been given the sole responsibility of approving books for print. Here he speaks in the third person about his responsibilities as Master and his previous experience in seeing a book obtain an imprimatur which contained "heretical expressions":

> Where the Father Master of the Holy Palace, appointed by Leo X with the approval of the General Lateran Council V to not permit the printing of any writing "unless they have been first approved and examined, as attested by the Apostolic See Cardinal vicar and Master of the Sacred Palace,"[687] does not believe himself to be cautious enough in good conscience to affix his Imprimatur to the writing by Canon Settele: Because it still pains him very much to have affixed it to the ***Metaphysica Sublimiore de Deo uno et Trino***,[688] trusting the approvals of the Revisors, whose

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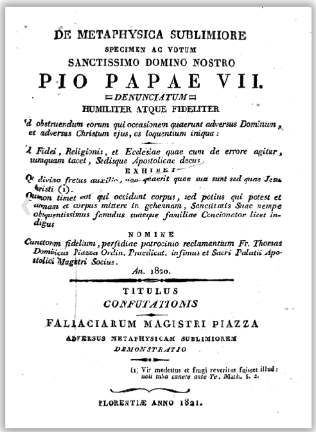
Scritture, e dei Padri, e se ha dichiarato e definito una volta che la dottrina, di cui si tratta, è contraria alla vera intelligenza delle Scritture, e perniciosa alla Cattolica verità, non fia mai che dichiari, e definisca il contrario, come si vorrebbe ora da qualche mal avveduto sofista" (*ibid*).

[687] "nisi omnia typis consignanda exminata primum probataque fuerint a Card. Urbis Vicario, ac Magistro S. P. Ap.lici"

[688] *The Metaphysica Sublimiore de Deo uno et Trino* was a treatise on the Trinity written by a Marco Mastrofini, which book had first obtained an imprimatur in 1808, but its publication was suspended for political reasons. The author asked for Pius VII's assistance in 1814. The pope approved a new set of advisors and the book received a second imprimatur in 1816 as Mastrofini was writing his third volume, right after which Anfossi denounced the book to the Inquisition. Mastrofini went around this and had a summary of his book published in Florence in 1818, with a second edition in 1821. In the end, however, after the death of Pius VII, Leo XII, Pius VIII and Gregory XVI, the book did not receive permission to

> work, other than the heretical expressions which are there, in the judgment of a Holy Doctor of the Church "Fidei dupliciter derogate" and his judgment is confirmed by the complaints which are heard all day long.[689]



DE METAPHYSICA SUBLIMIORE
SPECIMEN AC VOTUM
SANCTISSIMO DOMINO NOSTRO
PIO PAPAE VII.
=DENUNCIATUM=
HUMILITER ATQUE FIDELITER
'd obstruendum eorum qui occasionem quaerunt adversus Dominum, et adversus Christum ejus, os loquentium iniqua:
'l Fidei, Religionis, et Ecclesiae quae cum de errore agitur, umquam tacet, Sedisque Apostolicae decus
EXHIBET
Q' divino fretus auxilio, non quaerit quae sua sunt sed quae Jesu hristi (1).
Quinon timet eos qui occidunt corpus, sed potius qui potest et animam et corpus mittere in gehennam, Sanctitatis Suae nempe obsequentissimus famulus suaeque familiae Concionator licet indigus
NOMINE
Cunctorum fidelium, perfidiae patrocinio reclamantium Fr. Thomas Dominicus Piazza Ordin. Praedicat. infimus et Sacri Palatii Apostolici Magistri Socius.
An. 1820.

TITULUS
CONFUTATIONIS
FALLACIARUM MAGISTRI PIAZZA
ADVERSUS METAPHYSICAM SUBLIMIOREM
DEMONSTRATIO

(1) Vir modestus et frugi reveritus fuisset illud: noli tuba canere ante Te. Math. 6. 2.

FLORENTIÆ ANNO 1821.

Olivieri's Refutation of Anfossi

In August 1820, Olivieri attempted his refutation of Anfossi's *Motivi*. It is an incredible piece of propaganda. As even one staunch Catholic historian (who is an avowed Copernican and in no sense favorable to Anfossi), said of Olivieri's rejoinder: "Olivieri's report, as I have already discussed, contained a completely absurd interpretation of the decree of 1616 and of Galileo's condemnation…"[690] Olivieri begins:

> The Master of Sacred Apostolic Palace presented in a paper, which lists nine reasons, that "he believed, and believed so as not to have to allow Mr. Canon Settele to teach as a thesis, and not as a mere hypothesis as stipulated in the Decree of 1620, the mobility of the earth and immobility of the sun in the center of the world. In truth these title words show inexperience, that quickly you can understand that Anfossi not only damaged an important matter, but also the author of many printed books.

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be published. http://www.treccani.it/enciclopedia/marco-mastrofini_%28Dizionario-Biografico%29/

[689] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 317.

[690] Annibale Fantoli, *The Case of Galileo: A Closed Question*? 2012, p. 240. Fantoli calls it: "the 'remarkable' way out of the centuries-old impasse excogitated by the commissioner of the Holy Office [Olivieri] in 1820" (p. 245).

> Nothing is more false than this, that Canon Settele wants to teach the stability of the sun in the center of world. Inasmuch as he teaches with the worldwide agreement of modern astronomers, the sun is not the center of the world, and not even in the center of our own planetary system, but to only one of the two foci of the ellipse with respect to which each planet revolves around it.[691]

We see clearly what is driving Olivieri. It is his belief that the Keplerian system in which the Earth moves around the sun in an elliptical orbit is the correct and proven reality of cosmology. He has dispensed with any system, whether Ptolemaic or Tychonic, which has the sun and planets revolving around a fixed Earth, but has also rejected the pure Copernican system of circular orbits. He has no scientific proof for his conviction of the Keplerian system; rather, he is depending on the "opinions of modern astronomy."

Olivieri then develops Settele's universe to its logical conclusion. If the Earth is not in the center, then there is no center, and the sun is moving through the universe in an undefined location, nowhere near a center. With a few developmental differences, Settele's world is precisely the model of the universe proposed today by scientists such as Albert Einstein and Stephen Hawking. Olivieri states:

> Along with modern astronomers, Settele does not teach that the sun is at the center of the world: for it is not the center of the fixed stars; it is not the center of heavy bodies, which fall toward the center of our world, namely of the earth; nor is it the center of the planetary system because it does not lie in the middle, or center, but to one side at one of the foci of the elliptical orbits that all planets trace. Still less does he teach that the sun is motionless; on the contrary, it has a rotational motion around

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[691] "Il P. R.mo Maestro del S. P. Ap.lico. ha presentato a S. S.ta uno scritto, nel quale espone nove Motivi, per cui "ha creduto, e crede non doversi permettere al Sig. Canon Settele d'insegnar come tesi, e non come semplice ipotesi a tenor del Decreto del 1620 la mobilità della terra e immobilità del Sole nel centro del Mondo. Per verita queste sole parole del titolo mostrano un imperizia, che appena si può credere nel P. Anfossi non solo rivestito di una dignità così importante, ma autore di tanti Libri stampati. Niente è più falso di questo, che il Canon Settele voglia insegnare la stabilità del sole nel centro del mundo. Imperocchè egli insegna colla universalita de'moderni astronomi, che il sole non e nel centro del mondo, anzi neppure nel centro del nostro, sistema planetario; ma soltanto in uno dei due fochi delle elissi rispettive, che ciascun pianeta descrive d'intorno a Lui" (Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, pp. 317-318).

> itself and also a translational motion which it performs while carrying along the outfit of all its planets.[692]

Olivieri argues his points very cleverly. Rather than admitting to Anfossi's basic argument (that the Earth is not moving), he turns the tables to fault Anfossi for incorrectly describing Settele's system (*e.g.*, accusing Anfossi of saying that the sun is in the center of the universe), thus making it appear as if Anfossi is "inexperienced" in science and should not be involving himself in such matters. This method scores debating points with the Holy Office and especially with Pope Pius VII. In reality, his approach is a smoke screen to hide the real issue. The real issue, as stipulated by the 1616 and 1633 decrees, regarded whether the Earth moves, not whether the sun, in its own locale, moves or is fixed, or even whether any of the planets orbit in an ellipse. Ignoring this distinction, Olivieri tries to impress his colleagues by arguing that the sun not only moves, it also rotates, which we know by its moving sunspots, even though this feature is totally beside the point.[693]

Olivieri continues with another argument, but a surprising one:

> But does Canon Settele expect to teach the mobility of the earth as a thesis, violating the Decree of 1620? He neither teaches this as a thesis nor as a hypothesis.

Olivieri is aware of the 1620 decree under Paul V, which allowed the printing of the Copernican system only if it was presented as a hypothesis, not a thesis. Instead of answering the question directly, Olivieri introduces a new line of argumentation – claiming that Settele's book is neither a hypothesis nor a thesis. He does so by changing the definitions of the cosmological terms, and at the same time finds fault with Anfossi for either not accepting the changes or not being aware of them.

> If the Very Reverend Father [Anfossi] had had the necessary diffidence [humility] in himself regarding the material – that he did not know mobility well – he would have read in the Books of those times [Galileo v. the Church] what the mobility of the earth

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[692] Antonio Favaro, *Galileo e l'Inquisizione*, ¶30.

[693] "Non solo poi non insegna stabilità alcuna del Sole; ma all'incontro, che il Sole giri d'intorno a Se med.o con un perenne avvolgersi di rotazione, come ne fan fede I moti delle di Lui Macchie, dalle quail ancora gli astronomi ora deducono il period di tempo, in cui si compisce tale rotazione" (*ibid*).

> was, which was judged to be accompanied by falsities, and against Sacred Scripture.

In other words, Olivieri is making a case that the Church and Galileo were arguing about a *particular kind* of mobility of the Earth, not *any kind* of mobility. Therefore, since the discussion in the 1600s was confined to one *particular* issue, and that issue was "judged to be accompanied by falsities, and against Sacred Scripture," then that particular case is settled and is no longer relevant in the 1800s. As such, Settele, at least in Olivieri's mind, is not presenting that *particular* issue as a thesis or a hypothesis; rather, he is presenting a new thesis that has nothing to do with what was discussed in the 1600s, at least so he argues. He continues his new line of argument:

> With this reading, he [Anfossi] would have found that such mobility was that with which the heavy things would lose the center toward which they are drawn, and the light things would lose the center which they go away from. That mobility with which it took the earth from its air which surrounds it, so that extreme disorders would arise from such an abduction of the earth from the air, contrary to that which is experienced and is seen. He would also have found that neither Copernicus nor Galileo knew how to free the System which they followed from such an absurd mobility of the earth;

Olivieri is arguing that in the 1600s, the common belief, following Aristotle's notion of gravity, was that if the Earth moved around the sun it would cause a disruption of the Earth's atmosphere and thus remove all the air. Apparently it did not bother Olivieri that no such discussions took place either in the Church's deliberations with Galileo or in their final judgments against him. The Church simply stated that Galileo's propositions, from whatever their source or whatever their nature, went against the clear teaching of the Fathers, Scripture, and the interpretation of both as stipulated in the Church's hermeneutical tradition. Olivieri is simply reading back into the 1600s what he wants to see, since this, in his mind, will be the key that allows the Church to start out on a new road, unhindered by the past.

Olivieri also ran his historiography by Settele and he accepted it with open arms. Settele's diary says the following:

> Olivieri hopes that at this occasion one could withdraw from the Index…the books containing the movement of the earth, as we know, by Copernicus, Foscarini, Didacus a Stunica, Kepler, and

> Galilei. For thus would the work complete itself, and Anfossi and his clients would not have any more motives to support themselves with the prohibition of these books while quoting the decrees of their prohibition, as if they were still on the Index. I myself asked Olivieri, how one could be able to do this without contradicting oneself. He answered that they had been prohibited because they implicated 'absurdi terrestri' [*i.e.*, 'naturally absurd conclusions'], that now these [absurdi terrestri] do not exist any more, because all the strongest oppositions against the Copernican system had become 'absurdi terrestri.' This answer seems right to me.[694]

We can see clearly how the Big Lie is developing. It will spread like a cancer through the Holy Office and eventually to the papacy itself. It is analogous to Satan twisting what God said to Eve in the Garden of Eden: "God didn't tell you not to eat of the fruit because it would do you harm. He prohibited you because he knew it would make you a god like him." It is analogous to someone arguing that the Catholic Church forbade women priests in the past because she was too heavily influenced by a patriarchial society, but now that we have a balance between the sexes there is no reason the Church cannot change with the times, especially if "science" argues that women pastors would be highly beneficial for Catholic parishioners. In fact, such arguments were advanced by the 1976 Pontifical Biblical Commission, concluding there was nothing wrong with women priests. Any number of issues can be argued with the same rationale (*e.g.*, divorce and remarriage, sexual orientation, contraception, just war doctrine, capital punishment, usury, *etc.*). The reality is, however, that doctrines of faith and morals are not time-conditioned propositions or situation ethics that can change because of different cultural or intellectual climates. In the case at hand, either the Earth moves or it doesn't move. It makes no difference how it would move or why it would move. But Olivieri has succeeded in making it an issue of the how and why.

Olivieri continues:

> …and therefore such a mobility deserved to be prohibited from asserting itself; but since the daily motion of rotation and annual motion of translation of that earth were allowed by the celestial phenomena, they could be admitted as astronomical hypotheses in this way: which, to he who wishes to perceive in the ideas of others that which he perceives, means that it could be allowed to attribute as much rotational as well as translation motion to the

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[694] Mayaud, p. 253, from Settele's diary entry of June 15, 1822, p. 411.

> earth as he wanted, as long as that other confusing mobility was held to be false and damned.[695]

Olivieri is like a sharp lawyer defending a guilty client. He has only one shot a winning. He must to take the jury's mind off the real issue and get them thinking about something else, something that seems even more important than the original issue, even though, in reality, it is totally irrelevant. The Church has experienced many of these shysters both before and after Olivieri, and sometimes they even manage to get a large following. As noted, Olivieri, without any evidence that the relationship between the Earth's air and gravity was even an issue in the 1600s, claims that the Inquisition rejected Galileo based on the supposition that a moving Earth would probibit it from holding its air. Olivieri adds that since this same seventeenth century Inquistion could not deny the Earth could be moving due to what was observed in "celestial phenomena," then it could allow a moving Earth as a "hypothesis," but not a hypothesis in the Bellarmine sense of the term (*e.g.*, in the sense of reaching the value of infinity or knowing the complete value of π); rather, as a sort of scientific 'stop-gap' until an answer could be found for why the air wasn't sucked from the Earth as it moved. According to Olivieri, the only thing the Inquisition "held to be false and damned" was the model that forced the air to be removed from the Earth, not the model that had the Earth moving around the sun. This reasoning, of course, was totally fallacious, but Olivieri had the ear of his colleagues who were being heavily pressured by modern academia to drop primitive medieval cosmology and join the rest of the world. Thus Olivieri adds:

> Now, after the discovery of the gravity of air, it was learned that it forms a single compact mass with the rest of the terrestrial mass, such that in addition, both the heavy and the light, as far as their direction at the center, do not suffer any defect as a result of the rotation and translation of the earth in mass in the spaces of the Heavens.
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> Where in reality Canon Settele neither defends the mobility of the earth as a thesis nor as a hypothesis, that which was targeted by the Decree of 1616 and 1620 or in the condemnation of Galileo of 1633. The Most Reverend Father [Anfossi] did not notice that the Supplication of Canon Settele to His Holiness was directed at establishing this, which in fact it leaves intact and

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[695] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 318.

> which respect the condemnations of that time; but shows them to not be opposed to the doctrines of the modern Astronomers.[696]

This is the second time Olivieri has proposed that Settele is not presenting a thesis on heliocentrism to the Church. As we see again, he is reading back his present understanding of physics into the minds of the seventeenth century magisterium and concluding that they, apparently under the guidance of the Holy Spirit, could not have condemned a moving Earth, *per se*, but only the difficulties a moving Earth would present, such as the dissipation of air from the Earth. As such, Olivieri argues that Settele's book has nothing to do with the decrees of the 1600s but is merely a scientific treatise explaining, if the Earth were moving, it would present no scientific or theological obstacle for the Church, and therefore the Church should allow the Earth to move, as was the "common opinion of astronomers." After all, Newton had presumably shown that the smaller Earth must revolve around the larger sun; and Bradley had presumably shown that a moving Earth is what causes stellar aberration; and Calandrelli had presumably shown that a moving Earth causes stellar parallax. These were formidable foes for Anfossi. How could he stand against them?

Similar to Lazzari's attempt to persuade the 1741 Inquisition, so Olivieri does the same to the 1820 Inquisition:

> The Most Rev. Fr. [Anfossi] must be joking when he says that "these gentlemen…try to tell us that what is stated many times by the Holy Spirit is false, but that what their stellar parallax and aberration tell them is true." Then he calls as a witness Fr. Jamin, to persuade them of the incomprehensibility of God's works. He also dares say that "the best astronomers and philosophers do not agree among themselves in regard to these discoveries." But he does not mention anyone. However, the fact is, as I hear from those who are well informed, that although there is no universal consensus among the experts in the field about the annual parallax of fixed stars, the aberration of fixed stars and of the planets has been verified for at least a century and is regarded by all astronomers as a true physical demonstration of the earth's annual motion….Thus, it is not surprising that the Most Rev. Fr. [Anfossi] who has not had the patience of mastering these astronomical matters, should appear to be incredulous, and that so does the Monsignor Majordomo, who in his memorandum

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[696] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 319.

> claims to be "convinced of the uncertainty and the great deceptiveness of astronomical science."[697]

Olivieri goes on for many more paragraphs saying much the same, at one point declaring:

> Does the Most Rev. Fr. [Anfossi] think that today Tycho [Brahe] would declare himself against the earth's motion, against the universal persuasion acquired by astronomers more than two centuries after him, now that they believe the system of the earth's motion has been "proved as much as anything physical can be," as Lalande says.[698]

Later he adds:

> Most Rev. Fr. [Anfossi]…let us note that some of the most cogent proofs, such as nutation and the annual aberration of heavenly bodies, had not been discovered at the time of Gassendi…whereas the discovery of aberration and nutation is assigned to 1727….Before stopping this modest writing of mine, I must not be silent about the Msgr. Majordomo's assertion that "one can maintain as a thesis only what is true or what is believed to be incontrovertibly true"….But the fact is that nowadays astronomers really seem to be so convinced of the earth's motion that they "believe it to be incontrovertibly true."….it is certain that nutation, annual aberration, and other data that require more subtlety to be detected are believed to provide a new irresistible argument.[699]

As noted earlier, Olivieri is referring to the stellar aberration discoveries of James Bradley in 1727 and the stellar parallax discoveries by Calandrelli in the late 1700s. A close examination of Bradley's and other astronomers' work on this phenomenon reveals that Fr. Anfossi was actually right in saying that Olivieri's alleged evidence was a scientific canard being used to "tell us that what is stated many times by the Holy Spirit is false, but that what their stellar parallax and aberration tell them is true" and that "the best astronomers…do not agree among themselves in regard to these discoveries."[700] Although Olivieri then accuses Fr. Anfossi of "not mentioning anyone" who disagrees with these findings, from our modern perspective the record exonerating Fr. Anfossi is very clear, as we outline in Volumes I and II. Fr. Anfossi and the Vatican majordomo had very good reasons for refusing to put the Holy Spirit on trial. But Olivieri's arguments are very clever and thus difficult for a persecuted high churchman to resist. If one wasn't privy to the precise condemnations and permissions laid down in 1616, 1620 and 1633, one might be persuaded by Olivieri's preferred juxtaposition of the facts, especially the weaker prelates at the Vatican during the early 1800s who were the object of constant ridicule in the world's press for holding to geocentrism for so long.

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[697] *Ibid.*, ¶49.

[698] *Ibid.*, ¶53.

[699] *Ibid.*, ¶¶55, 66

[700] *Ibid.*, ¶49.

In any case, Olivieri faults Anfossi for failing to understand what precisely Settele was presenting to Pius VII. Oliveiri claims there is a distinction between presenting heliocentrism as a thesis and presenting how the heliocentric system operates correctly. Settele's book deals only with the latter and as such it, according to Olivieri: "leaves intact…the condemnations of that time [1616-1633]" and "shows them to not be opposed to the doctrines of the modern Astronomers." In Olivieri's mind it was the perfect solution. He kills two birds with one stone. Everyone should be happy. The Church should be happy because with this solution it doesn't sully the 1616-1633 decrees; and modern science should be happy because now the Church has finally taken the last obstacle out of the way and can rejoice with the world that everyone now believes the same thing. There is a bright future ahead for science and religion, as long as both recognize the superiorty of science in answering questions about the cosmos. The only one not happy was Filippo Anfossi, but he had every right to forego the celebration, for he knew that Olivieri had just pulled off one of the most deceptive campaigns since the ramblings of Arius.

After these preliminary remarks, Olivieri then addresses each of Anfossi's *Motivo*. Regarding Motive 1, he says:

> It is entirely exonerated from the presupposed simple observations. After all, here Father Master does not show the criterion which must be resplendent in a Theologian regarding the ability to mention or not a condemned doctrine with such or another qualification. The Theologians and the writers of a sentence can say things which belong only to them and not to the real decree of the defining power.

Anfossi's Motive 1 merely reiterated the specific condemnations on Galileo and heliocentrism, but Oliveiri, armed with his claim that Settele is not promoting heliocentrism, *per se*, but only how it might work if certain primitive objections are answered, faults Anfossi for appealing to the 1616 and 1633 decrees since, in Olivieri's estimation, those decrees apply only to the time they were written and not to Settele's time or any time thereafter. This, of course, is a ludicrous argument, since Olivieri hasn't first proven that the 1616 and 1633 decrees were predisposed to accepting heliocentrism only if the difficulties of a moving Earth could be solved. The argument of the "moving Earth difficulty" is one that Settele and Olivieri invented purely on their own. Anfossi was smart enough to see through it. The Church of the 1600s condemned heliocentrism simply because it made the Earth move, and the Church didn't care how that movement was proposed.

Olivieri moves onto Motive 2:

> The Father Master [Anfossi] produces a passage by the Most Reverend Pani without telling us from whence he took it, to prove against the Scioli that the censure of the two propositions of the mobility of the earth and the immobility of the Sun was not only done by the sole qualifying Theologians but was approved by the Pope. But what did the Pope of that time do following those qualifications? He had Galileo secretly ordered "to contain himself from teaching them and defending them," from which the Most Reverent Father [Anfossi] deduces that the Pope "not only approved the censure of the qualifying theologians, but in a certain manner sanctioned it with the penal injunction of being sentenced to jail. In truth I believe that here "the Scioli" are right and that the the secret injunction of the Pope – whereby a precept was in a concealed manner made to not teach two such propositions – was not an approval and that such propositions are "false and absurd in philosophy, one formally heretical and the other erroneous in faith" and the Theologians said it in conformity which they had given to qualify; but that it is enough to believe that the Pope did nothing other than believe such behavior was expedient, that is, that such propositions should not be taught by Galileo.

As is common with most heliocentric apologists, Olivieri tries to make it appear as if "the Pope did nothing" to facilitate Galileo's condemnation, except, perhaps, a little hand waving. For them the pope was an innocent bystander who is swept off his feet and carried by the fanatics and know-nothings surrounding him. As we noted earlier, even the 1992 papal speech employs a similar tactic when, five times in the speech, it attempts to blame the Galileo affair on incompetent but nameless "theologians" that it apparently considers expendable in order to save the Church from derision. Such are the ploys of those who have abandoned their reliance on the uniqueness of Catholic tradition, the tradition that affirms the truth in her early years and never forgets it in her latter years.

The reality is just the opposite of what Oliveiri is proposing. In 1616, Pope Paul V played a major role in both condemning Galileo and the heliocentric concept. As we noted earlier, on February 25, 1616, he ordered Cardinal Bellarmine to summon Galileo and, "in the presence of a notary and witnesses lest he should prove recusant, warn him to abandon the condemned opinion and in every way abstain from teaching, defending or discussing it." The result was the "Decree of the Sacred Congregation of the most Illustrious Cardinals of the Holy Roman Church *specially delegated by Our Most Holy Lord Pope Paul V* and the Holy Apostolic See to publish everywhere throughout the whole of Christendom." It contained six explicit paragraphs reiterating the condemnation not only of the book written by "Nicolaus Copernicus" but, more specifically, the original Greek inventors of heliocentrism as represented by "the Pythagorean doctrine – which is false and altogether opposed to Holy Scripture – of the motion of the Earth and the immobility of the Sun." The Church was going right to the root of the problem, – the false ideas propagated by the Greeks. Bellarmine then declares that Galileo "has only been notified of the *declaration made by the Holy Father* and published by the Sacred Congregation of the Index, whose content is that the doctrine attributed to Copernicus (that the earth moves around the sun and the sun stands at the center of the world without moving from the east to the west) is contrary to Holy Scripture, and therefore cannot be defended nor held. In witness whereof we have written and signed this with our own hands, on the 26th day of May 1616," showing again the prominent part played by the pope in the whole affair. Lastly, Guicciardini, the papal ambassador who knew of the pope's intimate involvement in the Galileo affair, prompts Finocchiaro to conclude: "The letter observes that Pope Paul V and Cardinal Bellarmine agreed that Copernicanism was erroneous and heretical. This was and remains precious information."[701]

Olivieri moves onto Motive III and IV:

> It seems that the Father Master [Anfossi] here proposed to himself that he should be pitied. Here is the title of Motive III: "Two Decrees of the Congregation of the Index, reported by Father Salvatore Roselli, Tome 2, pages 185 and 201". If the Father Master had had the patience (and he must have had it in a significant amount writing for His Holiness) to go to compare

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[701] As stated in *Retrying Galileo*, pp. 158-159. The March 4, 1616 letter from Guicciardini to Cosimo II was not published until 1773 by Angelo Fabroni in *Lettere inedited di uomini illustri*, Florence, two volumes, 1773-1775.

> the two decrees reported by Father Roselli who cites the *Index* of [Pope] Alexander VII, he would have seen in this same Index that the first of March 5, 1616 and reported by the same Father Roselli, truncated of a principal part of it, and that the embracing "omnes alios pariter idem docentes" about which it is said that "omnes respective prohibet, damnat, atque suspendit". A Father Maestro of the Holy Palace thus should have been ashamed of such a citation.
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> The Most Reverent Father asks himself about Motive III: "Now they want the Holy Congregation and the Pope to authorize Canon Settele to teach the exact same opinion 'ut ulterius hujus modi opinio in perniciem Catholicae veritatis serpat?'" Then, of Motive IV he says: "The Lord and Canon will wish to be authorized to teach "'principia S. Scripturae, ejusque verae, et Catholicae interpretationi repugnantia, quod in homine Christiano' and much more in a Canonical 'minime tolerandum' and teach them not as hypotheses, regarding which there was no difficulty but as theses?"
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> Here we will thus tell the Most Reverend Father two things: The first and, as he asserts falsely as it were, that it should be authorized that "Canon Settele teach the exact same" opinion; when the Canon affirms and demonstrates that his teaching is not of the same but of a different opinion.[702]

Essentially, Olivieri is repeating his argument, which is that Canon Settele should not be censored by the decisions of 1616, 1633 or even the 1664 *Index* of Alexander VII simply because he is not teaching the same thing that Galileo taught. This is Olivieri's 'backdoor' approach – produce the same result as Galileo, but do it by a different means and hope no one notices.

> The second one then is that the Father Master says in Motive IV that the Decree of 1620 was a monstrous sentence, that is that "there is no difficulty regarding the teaching as a hypothesis principia S. Scripturae, ejusque verae, et catholicae interpretationi repugnantia." From here we learn ever more how bad the obligaton is that leads him to this type of talking.[703]

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[702] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 320.
[703] *Ibid.*

Olivieri is referring to the fact that Anfossi believes the decision in 1620 to allow the printing of books on Copernicanism which treat it as a hypothesis was a bad one. Based on this, Olivieri then attaches bad motives to Anfossi's refusal to give Settele an imprimatur. But what seems bad to Olivieri is actually a virtue for Anfossi. Anfossi would not be the first to wonder about the wisdom of the 1620 decision, since, if the 1616 qualifiers, who were backed by Robert Bellarmine and Pope Paul V, regarded the heliocentric system as a "formal heresy" against Catholic doctrine; and if this same stipulation of "formal heresy" was added to the condemnation of heliocentrism in 1633, why would the Church of 1620 allow heretical material out in public just because it was labeled with the words "hypothetical"? Some might say that it would be little different than allowing Arius to publish his works denying the divinity of Christ as long as he had a label with the word "hypothetical" on the cover. The answer may lie in the fact that science still had a way of intimidating even the most faithful of clerics to settle for at least some bit of compromise.

Interestingly enough, Olivieri's chief collaborator, Fr. Antonio Grandi, tries to attack the problem not only claiming the 1620 decree allowing only hypothetical works on heliocentrism was wrong, but that the 1616 and 1633 decrees did not condemn heliocentrism at all, only Galileo's and his version of it. He writes:

> Honored by the Local Authorities of the delicate task of proposing a mediation that would preserve the dignity of the Holy See on the issue of printing the *Elements of Astronomy* by Canon Settele, I will make sure to perform this task as briefly as possible, remitting my opinions to the superior intelligence of the Local Authorities. In order to proceed in an orderly fashion, firstly I observe, that it cannot be presumed that the assertion of the movement of the earth, nowadays accepted, was judged wrong, and even less heretical. It is true that the theory of the movement of the earth and the immobility of the sun was condemned in 1616 as false and contrary to the doctrine of the Church; but it is also true that this Decree was mitigated in 1620, when it was allowed that this theory be presented as an hypothesis. Galileo was condemned as well, as the Cardinal Gerdil says in his *History of the Philosophic Sects*, vol. I page 259: "on the issue of the movement of the earth in the Inquisition, which nonetheless allowed to embrace the Copernican system as a hypothesis." But if this system had been judged wrong, or heretical, it cannot be supposed that the Church would have allowed to support it, even as a hypothesis; it could not have been allowed to protect those who were studying it

from the risk of sin against the Faith, if they had considered the system sufficiently supported by evidence. Therefore it seems to me that the system was never condemned as wrong or heretical; so it needs to be said, that the judgment of the Theological Evaluators, who evaluated the two propositions as follows:

> The proposition that the sun is the center of the world and does not move from its place is absurd and false philosophically and formally heretical, because it is expressly contrary to the Holy Scripture": "The proposition that the Earth is not the center of the world and immovable but that it moves, and also with a diurnal motion, is equally absurd and false philosophically and theologically considered at least erroneous in faith"[704]

…such a judgment, I said, had not been approved by the Congregation of the Holy Office, but had only been satisfied to declare the doctrine of Galileo pernicious and contrary to Holy Scripture. And as far as being contrary to Holy Scripture it must be said that it is understood to be judged so according to the literal sense of the Scripture itself. I observe, however, that when the lawsuit of Galileo was discussed in Rome and the very scholarly and pious Cardinal Cesare Baronio was questioned on this point, he responded "Spiritui Sancto mentem fuisse nos docere, quomodo ad Caelum eatur, non quomodo Caelum gradiatur" as is reported by Fabronio in the Vita del Galileo, section 79. Subsequently, that is in the year 1664, the two Decrees of the Holy Congregation of the Index of 1616 and 1620 in the series of the other Decrees were reported. It must, however, be observed that these Decrees no longer appear in the Indices of subsequent years, either in extended form or as a rule of generic prohibition. Finally, in the Index of 1858, as can be seen in the Letter of the Very Reverend Father Secretary to the *Index* to the Very Illustrious and Reverend Monsignor the Assessor, it was completely omitted from among the general Decrees issued to provide for the opportune brevity of the *Index*,

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[704] "Solem esse in Centro Mundi, et immobile motu locali. Propositio absurd, et falsa in Philosophis, et formaliter haeretica, quia est expresse contraria Sacrae Scripturae": "Terram non ess Centrum Mundi, nec immobile, sed moveri etiam motu diurno: est item Propositio absurd, et falsa in Philosophia, et theologice considerate, ad minus erronea in fide."

> the Decree of 1616, which stated that "Omnes Libri docentes doctrinam Pythagoricam de mobilitate terrae, et immobilitate solis" should be prohibited. As a result of this, the Copernican system became ever more general, and with the new observations was freed from some absurd ideas which initially accompanied it; and it was confirmed by new arguments and new demonstrations. It would be lengthy to report all the Authors, the pious ones, and the scholarly ones who have supported it and support it.[705]

As Fr. Grandi sees it:

- we cannot say that a moving Earth was judged wrong, much less heretical by the 1616 and 1633 decrees
- since Copernicanism was allowed as a hypothesis in 1620, then it could not have been judged as heretical prior to that
- therefore, only Galileo's system was condemned as pernicious and contrary to Scripture
- as for the rest of us, heoliocentrism could only be condemned on the basis of a literal reading of Scripture, but since Cardinal Baronius said the Holy Spirit did not teach us about the motions of the heavens, only about salvation…
- and since the condemnations began to be less emphasized in Indices subsequent to 1664…
- and since we solved the physical difficulties of a moving Earth and supported it with newer and better arguments…
- and since so many people now support heliocentrism,

- Conclusion: we should now accept heliocentrism as the truth

Finocchiaro sees Grandi in the same way:

> …Father Grandi. Working in agreement with Olivieri and basing himself on his argumentation, he had tried to realize the objective of saving the good name of the Holy See, substantially by emphasizing the fact that the Copernican system, by then recognized even by Catholic authors, had been purified from errors and inconsistencies which made it unacceptable in its original form. This was equivalent to maintaining that the

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[705] Roma, 1820 VIII 9, *Voto Del Consultore Antonio Maria Grandi*, Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, pp. 294-295.

> Church had not erred in 1616 by putting on the Index a work at that time so defective at the level of physics and that now the Church was legitimately authorized to approve it after its errors were corrected. And it was, as a matter of fact, this which 'was suggested' to poor Settele to make skillfully known in his work…That is, the Church had been right in condemning the latter from a scientific point of view, because Galileo had also upheld heliocentrism in its unsatisfactory Copernican form…[706]

We see how far these Keplerian and Newtonian influenced clerics are willing to move the goal posts to win the day for Settele. That is doesn't seem ludicrous to Father Grandi that the Church would entertain the idea of labeling *only* Galileo's teaching as "pernicious and as contrary to Divine Scripture" while, in fact, Foscarini, Copernicus and Zuinga had already been placed on the *Index* for saying the same thing; in addition to the fact, as we have seen from the historical record, that Paul V and Urban VIII took very active roles in the condemnation (the latter pope engaging in protracted correspondence with the Grand Duke of Tuscany about the "heresy" Galileo was spreading; and later sending out official notices of the Church's decision to all of Europe once Galileo was condemned); and that in order for Galileo to be convicted of being "vehemently suspected of heresy" in 1633 there had to be a formal declaration of what, precisely, the heresy was that he was suspected of holding, namely, heliocentrism. Forget the fact that the personal quip by Cardinal Baronius does not speak for the Church, least of all the Church of 1616 and 1633. Ignore the fact that science, by its own propositions and principles, can never prove whether the Earth is moving. Nevermind the consensus of the Church Fathers, which, as pointed out by Cardinal Bellarmine from the decrees of the Council of Trent, the Church is required to use as the foundation of Her doctrine. Father Grandi is willing to pretend none of these facts matter, as long as he can make the Church look good in front of the world.

Olivieri continues with Anfossi's *Motivo* V:

> Tycho Brahe was a Danish astronomer who was born in 1546 and who died in 1601. Hence it is after Copernicus whose famous work was printed in 1543. He invented a system which was a mixture of Ptolemaic and Copernican. The ancient Egyptians, it is known, recognized the turning around the sun of the two closest planets, Mercury and Venus: Tycho extended this to all of the planets, and with Copernicus, he made them orbit

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[706] *Retrying Galileo*, p. 520.

> (around the sun. With Ptolemy then he made them orbit)[707] around the earth not only the Moon, like Copernicus did, but the very sun, accompanied by the Planets, and almost its satellites. Now the Father Master, from the fact that Tycho formed his argument *ad verecundiam* – an appeal to reverence: "Mr. Can.co will not have the respect of these expressions of Scripture, was he heretical?" And he stated, "this Astronomer is far superior to ours."
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> Our astronomers however responded that although Tycho was Protestant, the Protestants, won over by the evidence of truth, loved to follow the discoveries of Copernicus, Kepler and Galileo, all of whom were great Catholic men. They added that no awareness of astronomical things could place them in the same field as Tycho. All things considered, for as great were Tycho's astronomical merits, his system is unbelievable, and not only with many explanations that are very probable, but with varieties that are persuasive and physically demonstrative, administered by phenomena, were refuted. Among these, it is enough to remember the nutation, and the annual peculiarity of the fixed stars and middle planets; phenomena which were observed in all of the stars and planets, necessarily introducing movement from the earth for immediate cause, from which they came from. Hence, it is not a marvel that Tycho's system had been abandoned by all of the later Astronomers.[708]

It is here, of course, that Olivieri has either shown his ignorance of science or his lack of patience for what science might discover in the years to come. Olivieri probably thinks Tycho's system is "unbelievable" because he, relying on what he understands of Newton's physics (as did everyone else at this time) cannot imagine how the larger sun could revolve around the smaller Earth. Little did he know that a physicist, Ernst Mach, would be born in the same year, 1838, that Fredrich Bessel discovered the first stellar parallax (which, ironically, was touted as the most verifiable proof of heliocentrism), and proceed to show that Newton's system was inadequate to explain the bigger picture – the universe and its stars in relation to the sun and Earth, as opposed to dealing with only a sun and six planets. In Olivieri's day, mankind had no concept of stars exhibiting inertial or gravitational forces on our earthly environment, and thus he had no concept that this tiny Earth could serve as the center of mass for a rotating universe. Olivieri had no concept that all of space contained a microwave background radiation whose temperature variations point back to the Sun-Earth envelope as the hub of the whole universe, and thus he had no concept that the very length of this hub, 1 astronomical unit, if applied to the Tychonic model, would allow the stars to rotate around it in such a way as to produce the very "nutation and the annual peculiarity of the fixed stars" that Olivieri complains above is missing from Tycho's model.

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[707] Brandmüller and Greipl's note #430 here states: "in the margin of Olivieri's manuscript."

[708] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, pp. 320-321. Olivieri is mistaken on Kepler, however, since he was a Lutheran.

As we have seen, on the one hand Olivieri argues against Anfossi by using the advances of science in the 1800s (*e.g.*, that air is kept in place by Earth's gravity) over against the lack thereof in the 1600s (that air would be removed if the Earth moved). On the other hand, Olivieri is quick to limit science to what he believes are the facts of his day, thus leaving no room for future discoveries in which the very system his Church believed for the prior 1800 years would, with a little faith and patience, manifest itself in the years to come. As it stands, not only did the proofs come, they came like an avalanche. In fact, during the very time Olivieri is arguing against Anfossi, the French scientist Dominique Arago is looking through his telescope in the early 1800s and observing that the Earth wasn't moving through space as Copernicus and Galileo said. On and on the years went and more and more evidence was uncovered. Unfortunately, every time there was a victory for the geocentric system in the 1800s and 1900s it was quickly overshadowed by false heliocentric claims (stellar parallax in 1838; the Foucault pendulum in 1860; *etc*.). Olivieri was the beginning of this obfuscation, but time has finally caught up with his ploy and will eventually overcome it.

Olivieri now moves onto *Motivo* 6.

> The Father Master [Anfossi] in Motive VI stated that if Benedict XIV "agreed for the right reasons well known to him, that he would not include in the *Index Librorum Prohibitorum* (List of Prohibited Books) the expressed Decree, he would not revoke it. Also Clement XIV, and his Successors agreed to the fact, that it would no longer be published in the papal letters, the *Bulla Cœnœ.* Is this why he perhaps has lost his vigor? Go find out at the Holy Apostolic Penitentiary." The Very Reverend Father seems to have given a great answer. But the fact is that it contains many wrongs, of which a Very Reverend Father Master could make official offenses; he and the council member of Sacred Congregation of the Index. Why did he not summarize the acts, to see how things went? He would have seen that such

deliberation was prepared with scholarly votes, and that he truly took aim at (for no mysterious reasons, but explained in his Position) eliminating such prohibition.

That if the Most Reverend Father [Anfossi], busy with his affairs and absorbed by the concern with printing books, had no sloth, that is, the desire to consult the Archive, he at least should have given a glance to the printed *Index* itself which, like the Codex which had specifically been entrusted to him for execution, one must suppose, he had on his nightstand continously. In the *Index* he thus would have seen that in 1758 in addition to the *Sollicita* Bull, there had been added a collection of the prohibiting Decrees of certain classes of Books under the name *Decreto de Libris proihibitis,* divided into 4 paragraphs, in the second of which was reported the prohibition which we are dealing with, since the title of it is "Libri certorum argumentorum prohibiti." Here he would have observed that there is no indication of it and that in the Introduction this exclusive rule is given "ut si quod circa librum aliquem in *Indice* non descriptum, et in regulis ejusdem Indicis non comprehensum, exoritur dubium, intelligi possit utrum inter prohibitos sit computandus."[709] It is clear that this rule is exclusive. A book, for example the *Filosofia naturale* by Newton, is not included in the general prohibiting rules of the *Index*. Neither do we encounter the material which he marked in this collection, added here. Thus it is understood that it is not to be considered among those prohibited.

This observation demonstrates how impertinent is the comparison of the Bull *In Coena Domini*. Inasmuch as only the (annual repetition of Holy Thursday in such a function in Rome, of the) publication was omitted, but here "omittatur decretum" is absolutely said. Then the Father Master would dare to assert that where a collection of cases had been made in which such censures are incurred with Apostolic authority, it not being a censure in such a collection, it is intended that it should not be counted among the censures; and that despite this, some censure omitted there would still follow? And then were there any of

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[709] "in order that, if something has not been described about some book on the Index, and has not been dealt with according to the rules of the same Index, a doubt arises whether it should be understood to be reckoned among the prohibited [books]"

> such collections?[710]

Olivieri and Anfossi are arguing about minutia regarding why certain documents dealing with this case weren't always published in a periodic manner. Anfossi claims that it is because they grew less and less significant until they died a natural death; whereas Olivieri claims that there was no need to publish them in every instance. This is a technicality that is beyond the scope of our analysis.

Olivieri moves on to *Motivo* 7 concerning the "Irreformability of Pontifical Decrees." This is a very intense and biting response by Olivieri:

> This title is deadly to the Most Reverend Father Master: the Pontifical Decree of 1758 for the *Index* is irreformable. Thus the Most Reverend Father Master is guilty of a grave failing by eluding it and deriding it, as he did. At the meeting, Canon Settele leaves all their vigor to the decrees of 1616 and 1620 and only demonstrates that the doctrine of the modern Astronomers is not the one which was targeted by those decrees, and in such an interpretation not only has the support of the Decree for the *Index* of 1758…

Olivieri's argument shows its deepest contradiction here. He claims that the "Pontifical Decree of 1758 for the *Index* is irreformable." If it is, then how could it go against an earlier irreformable pontifical decree given by Alexander VII in 1664 regarding the same *Index*? That is, if, as Olivieri has previously claimed, Benedict XIV's 1758 *Index* allows for books to be printed that treat heliocentrism as a thesis as opposed to a hypothesis, but the 1664 *Index* does not allow them to be printed as a thesis, who is right? Moreover, Anfossi's actual argument in *Motivo* 7 was not concerning the 1758 *Index* but the papally approved decisions against Galileo and heliocentrism. Anfossi stated: "The pontifical decrees, which is the true interpretation of the Scriptures, from which the Faith depends, are irreformable, and the two decrees of 1616 and 1620 regard the interpretation of the Scriptures, and faith, which is clear from their expressions: So they are irreformable: So you cannot do anything contrary to them." Apparently, Olivieri is including the 1758 *Index* in order to claim his own "irreformable" document for his argument.

Let's, for the sake of argument, allow Olivieri to apply "irreformability" to the 1758 *Index*. As such, in order to prohibit the 1758 *Index* from overruling the 1664 *Index* (if they are both "irreformable"), in addition to not overruling the 1616 and 1633 decisions that heliocentrism is "formally heretical," there must be a mollifying factor. What could it be? As we noted, Olivieri has come to depend on the argument that the 1616 through 1664 decisions were in a different genre and were for a different reason. That is, they didn't know certain scientific facts (*e.g.*, whether air would be eliminated from the Earth if the latter moved) and therefore, what they condemned in the 1600s was not the same thing as what is being discussed in the Settele case. But Olivieri's clever rationale is little more than a well-crafted fabrication, since the seventeenth century magisterium did not address the details of gravity and air currents specifically or the mechanics of the heliocentric system in general, much less make it a basis for why it decided against heliocentrism. Let us repeat: the Church of Galileo's day rejected heliocentrism, and specifically a moving Earth, because geocentrism was the consensus of the Fathers and the literal interpretation of Scripture that was passed down for 1600 years prior. Nothing can change that simple fact.

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[710] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, pp. 321-322.

Since Olivieri's rationale is fallacious, that leaves only one other possibility, if, indeed, the 1758 *Index* is "irreformable," as Olivieri claims. The only logical explanation is that the 1758 *Index*, since it also insisted on leaving Copernicus, Galileo, Kepler, Zuniga and Foscarini on the *Index*, could not have meant to allow other books espousing heliocentrism as a thesis to be freely published. In order to remain in line with the outright condemnations of heliocentrism from 1616, 1633 and 1664, and yet also remain in line with the 1620 decision to allow hypothetical treatments of heliocentrism, the 1758 *Index* would be required to allow books on heliocentrism only as a hypothesis. If Olivieri argued otherwise, then he would have put the "irreformable" 1758 *Index* at direct odds with the "irreformable" 1664 *Index*, which simply cannot be, otherwise the very concept of "irreformable" is itself reformable.

The issues concerning the "irreformability" of the decrees against heliocentrism need to be expanded. As they are, we will see Olivieri's devious means of escaping the problem. One of the more cogent analyses of this issue comes from Maurice Finocchiaro:

> Another key objection by Anfossi had been that papal decrees were unrevisable, and since the earth's motion had been condemned once, there could not be another decree withdrawing or revising the first. Olivieri did not reply by denying that the condemnation of 1616 was a *papal* decree but rather by denying that the earlier decree needed revision (§56). He had an argument why the condemnation of the earth's motion as contrary to Scripture did not have to be revised: it did not refer to motion, *per se*, or as it exists in itself; what had been condemned was the proposition that the earth moved in the sense of motion

> that implied all the mechanical difficulties that seemed derivable from it; and the earth's motion in this "devastating" sense was indeed contrary to Scripture. Correspondingly, the earth's motion theorized by the astronomer of Settele's time was a motion freed of such difficulties, and so it was not contrary to Scripture.

Again, we see Olivieri's novel attempt to change the terms of the debate from one of *strict motion* to one of *difficult motion*. Finocchiaro continues:

> This reply is interesting. Insofar as it spoke of unrevisability rather than infallibility, it was dealing with a more manageable concept. Moreover, it seemed to presuppose that there was a papal decree against the earth's motion, and so Olivieri's criterion for a papal decree seems less stringent than those prevailing today. He seemed to regard a papal decree as one which the pope made while discharging his official functions, such as being president of the Congregation of the Holy Office; examples of such decrees would be Paul V's decision that the earth's motion was contrary to Scripture (endorsed at the Inquisition meetings of 25 February and 3 March 1616) and Urban VIII's decision that Galileo be condemned (reached at the Inquisition meeting of 16 June 1633). Although Olivieri's criterion was probably historically correct, it is also important to point out that the definition of a papal decree ex cathedra was undergoing some evolution; thus by the end of the nineteenth century such a decree had to contain an explicit self-referential description that the decree was being characterized as ex cathedra and infallible.

Olivieri must go through these contortions because, as a high churchman, he is required to show the proper deference to previous ecclesiastical authorities in the tradition. The Catholic Church is built on what was decreed in the past, since it cannot change in the future. But the fault of course, is not all Olivieri's. As Finocchiaro points out, we all must contend with the "evolution" of papal infallibility and how it is applied, which then becomes the favorite cudgel of Galileo supporters who use it to dismiss sixteen hundred years of Church tradition and three papal confirmations of that tradition (1616, 1633, 1664) as inconsequential simply because they were not endorsed by an "ex cathedra" pronouncement. This apologetic, of course, conveniently disregards the fact that the unchaning Ordinary magisterium for those sixteen hundred years is just as infallible as a papal pronouncement, which is precisely why

Paul V, Urban VIII and Alexander VII were compelled to honor it, and which was precisely Anfossi's argument against Olivieri.

> Finally, Olivieri seemed to presuppose a peculiar theory of meaning according to which the meaning of a proposition includes the consequences implied by it, or perhaps the consequences allegedly derivable from it; but this theory of meaning does not seem to be at all plausible.

Finocchiaro is being polite. What he means is that Olivieri concocted a facile and unheard of ecclesiastical maneuver in order to whittle down the Church's condemnation of heliocentrism to nothing more than the narrowminded musings of primitive medievals stuck on Aristotle; and he did so without even the slightest indication from the official records that concerns about how motion would be accomplished were relevant; or that even if they were relevant, it wouldn't have mattered in the end in any case since the issue strictly concerned whether the Earth moved, not whether it was possible to move.

> Finally, in his reply to Anfossi's reminder that Galileo had been convicted of "vehement suspicion of heresy" (§61), Olivieri did not question its legitimacy or correctness; he only proposed a reinterpretation of the (suspected) heresy in question. He was careful enough to admit the twofold character of the heresy, and that one of them was the methodological and hermeneutical principle that denies [seeks to deny] philosophical authority to Scripture. But he took the other (suspected) heresy to be the theory of the earth's motion, including the old Aristotelian physics (that led to insuperable difficulties and mechanical absurdities for the simple reason that the combination was internally incoherent) and the thesis that the sun is completely motionless (which had been long refuted by modern astronomy)…. [711]

In the end, Olivieri manages to twist the condemnation of "philosophically absurd" away from the original intent it had in 1616 and 1633[712] and turn it into the difficulties that a moving Earth presented to the science of that day. He writes:

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[711] Maurice Finocchiaro, *Retrying Galileo*, pp. 220-221.

[712] According to the 1616 and 1633 decrees, a non-central, moving Earth, similar to a non-moving sun, is judged as "absurd" and "false philosophically." The word "absurd" is employed because of the simple logic involved. If the sun moves

> I hope the Most Rev. Father [Anfossi] can quietly accept that that system was not declared "heretical" or "erroneous in the Faith"; that due to their ignorance, Copernicus and Galileo were unable to remove the "serious difficulties" affecting our globe, and so their system was infected with a devastating motion; that therefore the condemnation was based on the philosophical absurdities on account of which the system had consequences implying that the doctrine (I mean *their* doctrine) could be called contrary to Sacred Scripture; and that all this does not harm in the least the respect due to the decrees of the Sacred Congregations.[713]

Olivieri had an additional explanation for the wording of the 1616 and 1633 decrees. He begins by making the preposterous claim that the order in which the magisteriums listed their condemnations (*i.e.*, first "philosophy," second "Scripture") meant that they were not really concerned about the second.

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around the Earth, then logically the Earth cannot move around the sun. It is a simple matter of choosing the right system. If A is right, it would be absurd to adopt B. "False philosophically" refers to the fact that the Pythagorean school of philosophy had adopted heliocentrism in opposition to the philosophical school of Aristotle. In medieval times, "philosophy" was a much more general term than its usage today. Lastly, the change from "formally heretical" with regard to the movement of the sun, to "at least erroneous in faith" with regard to movement of the Earth seems a bit inconsistent but there is a reason for it. First, as noted earlier, the Church admitted that certain Scriptures might possibly be interpreted as referring to the stability of the Earth as opposed to its being immobile in space. As such, it would not be formally heretical to say that Psalm 104, for example, was speaking about Earth's longevity in time rather than its position in space. But since it was certain that the sun revolved around the Earth, it would still be "at least erroneous in faith" for one to claim that the Earth moved since obviously only one body can be revolving around the other. Second, normally ecclesiastical censures will be issued at three distinct levels of severity: (a) heresy; (b) erroneous in faith; (c) rashness. The difference between (a) and (b) in the case of Galileo is that there was some doubt about whether Galileo actually held, at least in the absolute sense, to the concepts that he put in his Dialogo since he sometimes gave the impression they were hypothetical. As such, Galileo is convicted for being "vehemently suspected of heresy" (see below) as opposed to being in actual heresy.

[713] Olivieri's November 1820 Summation, "Ristretto di Ragione, e di Fatto," ¶42, as cited by Finocchiaro in *Retrying Galileo*, p. 209. Olivieri does much the same in ¶46, accusing Anfossi of not knowing what the 1616-1633 Sacred Congregations meant by the Earth's mobility.

> You will certainly find in Scripture and in the Church Fathers assertions of terrestrial immobility that is opposed to the devastating mobility; but to properly understand the latter with its problematic characteristics, you will have to focus on what you perceive in experience and apprehend by reason, for here one is not dealing with a supernatural mystery but with something accessible to experience and observation; that is, you will need philosophy to make you perceive the falsity and absurdity, so that based on these you can understand the language of Scripture and of the Church Fathers, which uses experimental notions. This is the way it must be; and this is in fact shown by those theologians and by the Sacred Congregation, both of whom pronounced the doctrine false before calling it contrary to Sacred Scripture; by doing so they warned us to fix our attention on the philosophical falsity, and thus to not go astray in thinking of contrariety to Sacred Scripture, for mobility and immobility are not things which God has chosen to reveal to us; rather he has inspired the Sacred Writers to express to us what our senses perceive in the way they perceive it. Recall the statement of our Holy Teacher [Aquinas]: "Moses describes what is obvious to sense, out of condescension to the ignorance of the people"[714]

This is what made Olivieri a prominent and lasting churchman. He was able to play the political game of not offending his superiors or his opponents, and was also able to preserve the "decorum" of the Church in front of the rest of the world. Hence, he would give his proper respects to all the previous decisions and yet he would present them to his peers with just enough twist to make an alternative view palatable to them. This kind of diplomacy was precisely what was needed to make this pig fly.

For the record, Aquinas was a devoted geocentrist who based his belief on the literal interpretation of Scripture's cosmological passages, in addition to his firm commitment to the interpretation of Scripture according to the consensus of the Church Fathers. Second, the sentence from Aquinas that Olivieri chooses to support his argument is not only taken out of context, it is in a passage where Aquinas confirms his belief in geocentrism! In the passage, Aquinas' only concern is whether the whole firmament itself revolves around the Earth or that only the stars revolve around the Earth, the same question that Chrysostom had at one time. Aquinas writes:

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[714] *Retrying Galileo*, p. 209.

> Reply OBJ 3: According to Ptolemy the heavenly luminaries are not fixed in the spheres, but have their own movement distinct from the movement of the spheres. Wherefore Chrysostom says (Hom. 6 in Genesi) that He is said to have set them in the firmament, not because He fixed them there immovably, but because He bade them to be there, even as He placed man in Paradise, to be there. In the opinion of Aristotle, however, the stars are fixed in their orbits, and in reality have no other movement but that of the spheres; and yet our senses perceive the movement of the luminaries and not that of the spheres (*De Coelo* ii, 43). But Moses describes what is obvious to sense, out of condescension to popular ignorance, as we have already said (Q67, A4; Q68, A3). The objection, however, falls to the ground if we regard the firmament made on the second day as having a natural distinction from that in which the stars are placed, even though the distinction is not apparent to the senses, the testimony of which Moses follows, as stated above (*De Coelo* ii, 43). For although to the senses there appears but one firmament; if we admit a higher and a lower firmament, the lower will be that which was made on the second day, and on the fourth the stars were fixed in the higher firmament.[715]

When Olivieri tries his hand at principles of biblical interpretation, similar to what Galileo did with Bellarmine, he creates problems so that he can fix them, but in reality the problems do not exist:

> The "arm of God" is an expression that sounds absurd if understood literally; thus it is interpreted in a figurative sense, as a figure of speech….it is enough to reflect that Catholics learn from the Church and study in its theological schools when one should regard as absurd the meaning of scriptural words

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[715] *Summa Theologica*, Part 1, Question 70, Article 1, Reply to Objection 3. The second reference to Moses' accommodation to the ignorance of the people noted above (Question 68, Article 3) shows us what Aquinas' intent really was. He writes: "Moses, then, while he expressly mentions water and earth, makes no express mention of air by name, to avoid setting before ignorant persons something beyond their knowledge. In order, however, to express the truth to those capable of understanding it, he implies in the words: 'Darkness was upon the face of the deep,' the existence of air as attendant, so to say, upon the water. For it may be understood from these words that over the face of the water a transparent body was extended, the subject of light and darkness, which, in fact, is the air."

> variously labeled literal, material, natural, *etc*. and adopt a meaning variously called translated, improper, and what not.[716]

What Olivieri does not admit, however, is that the Catholic "theological schools" for the 1800 years prior to Olivieri's ascendancy to his post had always taught that the "arm of God" was not to be interpreted literally, for in the hierarchy of exegetical truths, the fact that God was a spirit overrode any temptation to assign human body parts to Him. By the same token, however, the Church also taught that Scripture's cosmological passages were not prohibited by the hierarchy of biblical truths to be interpreted literally. Of course, Olivieri was probably aware of these historical principles in Catholic exegesis but he ignored them, believing he had a trump card, as it were, with his alleged "scientific proofs" for Kepler's elliptical system. So strong were these proofs, he believed, that science itself would now serve as the 'hierarchy of truth' to make exegesis bend away from a literal interpretation of scriptural cosmology. Thus, he boasts:

> But what difficulty is there if by subsequent discoveries men correct what they thought was contrary to the Sacred Scriptures? Of if those who are more knowledgeable in the sciences are in a better position to correctly understand what the Scriptures say about them?[717]

As Finocchiaro notes, "Thus, although some may admire Olivieri's balanced impartiality, his argument was Solomonic in more than one sense; it was a double-edged sword of questionable value to a friend of the historical Galileo."[718] Finocchiaro's statement shows that, being a heliocentrist himself, he is looking for someone to provide satisfactory arguments for the Church in order to rehabilitate Galileo, but he does not find it in the person of Maurice Olivieri. As Finocchiaro sees it, Olivieri is a sophist who is engaging in double-dealing. Unfortunately, it was precisely these specious arguments of Oliveri that eventually convinced the Holy Office to give the imprimatur to Settele, and, as we will see later, convinced Gregory XVI to take Galileo off the 1835 *Index*.

In the end, it may not have mattered what arguments Olivieri brought forth. The "opinions" of modern astronomers who were advocating a moving Earth was holding the weight in the deliberations and the Church was heavily influenced by that indomitable authority. "Science," and its handmaiden, "Scientism," would become the Church's most formidable competitor in the remainder of the nineteenth century and on into the twentieth century, especially with the next foray centering on Darwin's evolutionary theory published in 1859, just three decades later. There seemed to be much larger forces at work in this little crucible of 1820-1822 than just Fathers Anfossi and Olivieri seeing who could present the best argument.

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[716] *Summation* ¶45.

[717] *Ibid*., ¶47.

[718] Maurice Finocchiaro, *Retrying Galileo*, pp. 220-221.

Regarding the 1664 *Index*, Olivieri seeks to lessen its impact:

> But turning to the objection of the *Index* of 1664, it helps to observe that in the *Indices* thereafter printed in 1670 under Clement X, 1681 and 1683 under Innocent XI, 1704 under Clement XI, 1744 and 1752 under Benedict XIV, the collection of decrees of the prohibitions and suspensions of books in full length, together with these with which we are dealing, was entirely omitted without giving any reference in any place to the general prohibition of all the Books which teach "mobilitatem terrae, immobilitatem solis."[719]

In other words, Olivieri is attempting to make it a significant fact that the subsequent *Indices* did not have the "full length" version of the prohibitions that the 1664 *Index* contained. Conversely, Anfossi had made an opposite but corollary argument in stating that the 1664 *Index* included all the wording of the 1616 and 1633 decrees and therefore was confirming all their condemnations. Olivieri's argument is fallacious. It doesn't matter whether subsequent Indices didn't have the entire wording. It only matters that they contained the reference to the entire wording, as well as making no attempt to alter or undue the condemnations of 1616 and 1633.

In regards to the relevance of the 1616 and 1633 decrees, Olivieri tries another tactic. He comments on a 1661 book printed in Rome in which Eustache De Devinis argued against the cosmological system of Huyghens. The book quotes a Father Fabri, S.J. as saying "Therefore, nothing prevents that the Church should understand those places of Sacred Scripture in the natural sense, and declare how those things should be understood, so long as the contrary is brought about by no clear proof,"[720] and that if such happens, "the Church will not hesitate in any way to declare that these passages should be understood in the figurative and improper way, like the one of the poet: 'the river banks and the cities recede.'" Olivieri concludes:

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[719] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 283, §103.

[720] "Nihil igitur obstat, quin loca illa (della Sacra Scrittura) in sensu naturali Ecclesia intelligat, intelligenda esse declaret, quamdiu nulla demonstratione contrarium evincitur."

> The conditional *quamdiu* ("unless") he shows a persuasion that the Sacred Congregation had not issued an absolute proscription of the mobility of the earth. I find this opinion cited in a Letter of M. Auzout printed in those times in which Father Fabri is said to be "one of the most zealous defenders of the contrary opinion, who can know as much as anyone else the sentiments which are held on this matter." In that letter, he same Auzout impugns those who, against the evidence of the eyes with the aid of the telescope, persisted in denying that Jupiter and Saturn had moons out of fear "that (the words of this Writer) the conformity of these moons with our own might prove the conformity of our earth with these planets which, drawing their moons with themselves, turn around the sun" (See Mem. de l'Accad. Reale delle Scienze 1666. al 1669 [Memoirs of the Royal Academy of Sciences 1666 to 1669]. Tome VII. part 1. Paris 1729. pages 21. 59.)[721]

Seeking to make the condemnations and the prohibitions of the Sacred Congregation conditional until a demonstration of the earth's movement be demonstrated is similar to the rationale Cardinal Bellarmine employed with Galileo, but as we have noted earlier, scholars conclude that Bellarmine did not mean the decrees against heliocentrism or the prohibition for Galileo not to teach heliocentrism were conditional. Rather, Bellarmine was being his usual polite self, which then provided him a platform from which to offer a counterargument to his opponent, but one that he knew his opponent could not answer. In other words, Bellarmine's was a calculated maneauver to seal his decision, not a conditional proposal to give hope to his opponent. Since the reality of relative motion was very evident by this time (which even Galileo discovered in his day), how could science ever provide proof the Earth was moving? Bellarmine knew this instinctively, otherwise, as most scholars agree, he would have never pursued the official silencing of Galileo and put the Church's magisterium at risk of being wrong. Still, Olivieri must grasp at these straws in hopes that one of them, or perhaps a combination of them, will put sufficient doubt into the mind of his fellow prelates so that they simply give him the benefit of the doubt. As Mayaud notes, "Certainly for those who have formulated it, the decree [of 1616, 1633, 1664] presented a definite character, but the mode itself, according to which is is drawn up (and this is also the case for the sentence of Galileo's abjuration), implies conditionality."[722] In reality, the decree "implies conditionality" only to those, like Mayaud, who need it as a basis for relaxing the Church's clear condemnation of the heliocentric system.

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[721] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 283.

Olivieri continues:

> …but furthermore (and also) he increases an inescapable force among all Catholics, even Gallicans, it is such that from 1634 on, no resentment was seen anymore by the Popes, nor was any book prohibited from the Copernican doctrine, however the doctrine should become universal, and as the Books which had become famous had been published, such as for instance the *Filosofia* of Newton.[723]

Olivieri is arguing from wishful thinking. He appeals to "no resentment by the Popes" after 1634, but history shows that just thirty years later not only did Alexander VII keep the condemned books on the 1664 *Index*, he also added Johannes Kepler – something the 1616 or 1633 Church had not done. Kepler's *magnum opus* was published in 1630, the *Epitome astronomiae Copernicanae*, written for the express purpose of redoing Copernicus' circles with elliptical orbits. It had been condemned and placed on Alexander VII's 1664 Index and continued on the Indices of 1741 and 1758. Although the 1616 and 1633 magisterium did not formally condemn Kepler, the fact is that Kepler was not under their canonical jurisdiction for Kepler was a Lutheran.[724] The four other heliocentrists that were formally condemned by the magisterium were all Catholics (Copernicus, Foscarini, Zúñiga and Galileo). But after the 1633 trial of Galileo, Protestants began touting Kepler's *Epitome* as a means of protesting the Catholic Church's "censorship of heliocentrism," and thus the Church decided to condemn Kepler's book in its 1664 *Index*. Hence, in regards to Olivieri, the only "devastating" features of his Summation are the historical facts that expose his attempt to twist and distort the truth.

The addition of Kepler to the *Index* entirely defeats Olivieri's argument, which claimed Anfossi was wrong in accusing Settele because Anfossi didn't understand Settele's use of the Keplerian planets revolving around two foci (as opposed to the circular orbits of Copernicus' system). Similarly, Olivieri made a big issue over the idea that Paul V and Urban VIII failed to fix Copernicus' circular orbits with Kepler's ellipses and thus were forced to condemn Copernicus' model because it supposedly had a mechanical defect. Perhaps someone such as Olivieri would be inclinded to work with such an absurd scenario since he didn't see Kepler's name on the 1616 or 1633 *Index*. But all hope of that was lost once Kepler, along with his elliptical orbits, was added to the *Index* in 1664, and especially under the direction of the Supreme Pontiff. Additionally, Mayaud points out that in 1739 Francesco Algarotti's book on Newtonian mechanics was placed on the *Index*.[725] Evidently, Alexander VII's wording was so strong that it had little problem influencing an Index published seventy-five years later.

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[722] Mayaud, p. 263.

[723] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 323.

[724] In 1584, Kepler attended the Protestant seminary at Adelberg. In 1589 he began studies at the Protestant university of Tübingen. In 1594, he became professor of mathematics at the Protestant seminary in Graz, where he remained until 1600 until the Counter-Reformation forced all Protestants to leave the province.

As for Newton, above Olivieri makes reference to Newton's *Filosofia* as an example of Copernican books that were or should be published. This is a rather revealing comment. If Oliveiri is referring to the book with the title "Newton's Filosofia" or "Elements of Newton's Filosofia," it was not written by Newton but by Voltaire in 1738, who was an atheist and one of the philosophical engineers of the French revolution and the overthrow of the Catholic Church in France. If Olivieri is referring to Newton's *Philosophiæ Naturalis Principia Mathematica* of 1687 through 1726, as we noted earlier, the Catholic editors, Thomas Le Seur and François Jacquier, put a disclaimer on the *Principia*, beginning with the Geneva edition in 1760, followed by Prague in 1780-85, and finally in Glasgow in 1822 and 1833, the very years Olivieri is trying to defend the heliocentric system with his novel arguments using Newtonian physics in the audience of Pius VII. Ironically, the disclaimer reads:

> Newton in his third book assumes the hypothesis of the earth's movement. The author's propositions could not be explained except on the same hypothesis. Hence we have been obliged to put on a character not our own. But we profess obedience to the decrees made by the Supreme Pontiffs against the movement of the earth.[726]

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[725] Mayaud, *Condemnation*, p. 258, n. 46.

[726] *Philosophiæ Naturalis Principia Mathematica*, Isacco Newtono, PP. Thomæ Le Seur & Francisci Jacquier, Genevæ, MDCCXXXIX [1739]. Original Latin: "DECLARATIO: Newtonus in hoc tertio Libro Telluris motæ hypothesim assumit. Autoris Propositiones aliter explicari non poterant, nisi eâdem quoquè factâ hypothesi. Hinc alienam coacti sumus gerere personam. Cæterum latis a summis Pontificibus contra Telluris motum Decretis nos obsequi profitemur." Above translation taken from Rev. William W. Roberts in *The Pontifical Decrees Against the Doctrine of the Earth's Movement*, p. 53.

It is obvious, then, Olivieri had a distorted concept of "no resentment was seen anymore by the Popes, nor was any book prohibited from the Copernican doctrine."

Here is the remainder of his argument on Anfossi's *Motivo* 7:

> The Father Master [Anfossi] will thus say that "the grave error, the formal heresy, the pernicious doctrine" was peacefully established, and that all Popes have for almost two centuries in the meantime slept, and the most scholarly of these, Benedict XIV, was guilty of such a prevarication. But, Father Master, this is certainly heretical. Therefore you are on the side of error, and are there with a blind obstinence. But I hope that this ferocious fixation of fantasy has passed now that you have authentically heard the resolution of the Supreme.

As we have seen, it is Olivieri who is in error. He does not know the science as well as he thinks he knows it. The fact that he feels not the slightest compunction for imposing his own scientific criteria upon the Catholic magisterium of the 1600s; and the fact that he didn't notice that his mentor Johannes Kepler and his elliptical orbits were later placed on the *Index* alongside of Copernicus and Galileo, suggests that although Olivieri is both conniving and inept, he was good at bending the ear of the infirm and compliant Pius VII. Perhaps the pope was at least smart enough not to sign his name to anything so as not to make his capitulation worse than it could have been.

Olivieri then moves on to *Motivo* 8, "The Decorum of the Holy See":

> Even this title kills the obstinacy of the Father Master. It is the decorum of the Holy See that it should not only make itself ridiculous but also exorbitant to the scholars of the Century with the interpretation of Your Decrees in a manner that they are repelled at the universal Sentence of the experts in the art in what is uniquely dependent upon human reason and observation? Is it decorum that the decrees of the Holy See which are more wise should be abandoned and trampled to follow an inexperienced interpretation of other (decrees) against the fairly clear sense of the Holy See?[727]

Olivieri is using his previous argument. For him, Anfossi has an "inexperienced interpretation" of the 1616 and 1633 decrees since, as Olivieri reasons, the decrees were not against heliocentrism, *per se*, but only against the erroneous and unexplained model of heliocentrism Copernicus and Galileo were advocating (*i.e.*, models that could not explain the relationship between air and gravity and did not use the elliptical orbits of Kepler). Because of Anfossi's insistence, Olivieri claims he is making the Church look "ridiculous" by adhering to dogmatic "Sentences" from tradition when the issue is clearly one of science (*i.e.*, "human reason and observation").

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[727] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 323.

Olivieri moves onto *Motivo* 9:

> The Most Reverend Father [Anfossi] turns the same stone over again and again. The interpretations given by him to the ancient decrees wish that it should be taken for the same Decrees, against the perennial sense of the Holy See, and the Decree of the *Index* under Benedict XIV. These (well cared for) assure us that the Copernican system the defense of which today is not contrary to that moderate liberty which it must be left to the interpretation of the Holy Scriptures in the objects purely dependent on reason and experience. This is the rule followed by the most scholarly Fathers and Doctors, such as St. Augustine and St. Thomas.

When Olivieri speaks of the "perennial sense of the Holy See" he is inferring into it his novel concept that the Holy See was not interested in teaching geocentrism or condemning heliocentrism. But the "perennial sense" began in the consensus of the Fathers through the 1566 Tridentine catechism of Pius V and the three popes of the 1600s who approved the condemnation of heliocentrism as a formal heresy. Olivieri pins his hopes on Benedict XIV, but Olivieri has shown nothing to prove that Benedict XIV intended to allow books that taught the Copernican system as a thesis in opposition to the 1620 decree that they were to be published as hypotheses; and logically, Oliveiri cannot explain why, if such was not Benedict's intention, that as pope he kept Copernicus, Galileo, Zuniga, Kepler and Foscarini on the *Index*. This glaring contradiction in Olivieri's analysis is precisely why he later seeks to have them removed in 1822 when Anfossi, once again, exercises his rightful post and denies an imprimatur to Pietro Odescalchi's book for including an extract of Settele's book.[728] Olivieri is not successful with Pius VII, but as we will see later, he uses the same tactics in 1835 with Gregory XVI and is successful.

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[728] Olivieri writes: "Considering all this, it seems to me that one should now more than ever suggest to remove from the *Index* the three named books (Copernicus, Zuniga and Foscarini) and at the same time the citation of these decrees" (*ibid.*, p. 426) Apparently, Galileo would need to be left on because earlier Grandi argued that the 1616 and 1633 decrees were directed against Galileo and no one else.

Olivieri also tries to make a case that such issues are "purely dependent on reason and experience" and cites Augustine and Thomas as his support. But both Augustine and Thomas were geocentrists on the same grounds the Church was – their gift of reason led them to accept Scripture, and, more importantly, the Church's confirmed literal interpretation of Scripture's history, as the ultimate authority on the cosmos, especially since their reason also led them to realize they could not observe the world from space and see which object was revolving around which. Olivieri, like many heliocentric apologists ancient and modern, comes to the debate believing that he has a whole arsenal of proofs for his heliocentric system, but none of them hold up to scrutiny. In the end, Olivieri is in the same place that Galileo was two hundred years earlier when Galileo was depending on the specious arguments of the Earth's tides and Jupiter's moons to win the day with Bellarmine and Pope Urban VIII. He believed he had scientific proof when he only possessed data that can be interpreted more than one way.

Olivieri continues:

> Nothing is easier than demonstrating that in none of the Written texts objected to are we taught that the earth does not have the movements which the Copernican system imports, or that the Sun has those, which takes them away.

It appears from Olivieri's reference to "the Written texts" (Scritturali) and his reference below to "the Holy Writer" (his Italian: Sacro Scrittore) that both refer to Scripture. As such, his attempt here is to prove his point by using a double negative, *i.e.*, Scripture does not say the Earth does not revolve around the sun. Similarly, Scripture does not say the moon is not made of green cheese, but that does not mean the moon *is* made of green cheese. The reality is, Olivieri, like Galileo, wants Scripture's cosmological passages to be interpreted non-literally so that the claim can be made that "Scripture does not teach against the Copernican system." The question Olivieri does not answer is: does he have the right to change the interpretion from literal to non-literal after the Church held to the literal interpretation for 1800 years prior? Olivieri mistakenly believes he has such a right for the same reason Galileo did – he believes he has scientific proof for heliocentrism. Suffice it to say, as we discovered with Galileo "proofs," we also know Olivieri had no proof.

Olivieri continues:

> The "firmavit orbem terre qui non commovebitur" excludes the destruction by earthquakes and that (devastating mobility of which now there is no problem in the system, as we said). The earth which "is in eternity" is opposed by the Holy Writer to the "generation comes, generation goes," and again not contrary to the rotation or translation of the terrestrial mass but the devastating mobility which would prevent the successive generations from taking place. The birth and setting of the sun, and going from Austro to the Kite, and from the Kite to Austro, expresses the daily and the apparent annual movement of the Sun produced by the movements of the earth (but could not such appearances form for spectators thrown down and even left behind by the devastating mobility).

Olivieri is quoting from Psalm 93:1 (Ps 92:1 in the Vulgate) the sentence, "the earth is firmly established and will not be moved," and Ecclesiastes 1:4-5: "A generation goes, and a generation comes, but the earth remains for ever. The sun rises and the sun goes down, and hastens to the place where it rises." He is arguing as he did earlier that once modern science discovered how the Earth's atmosphere can stay attached to the Earth even though the Earth is moving, it was no longer necessary to view passages such as Psalm 93:1 as teaching the Earth was motionless in space. As we noted, no such discussions took place when the Church condemned the concept of a moving Earth in the 1600s. This is simply Olivieri's attempt to create a problem that he can solve in order to take the focus off the real issue, which is that the Church decided the issue based on divine revelation and the correct interpretation thereof, not on whether a moving Earth was scientifically feasible. Additionally, Olivieri's anecdote doesn't provide any proof for his case, since a non-moving Earth will also be free of the "devastating mobility."

> So also (having removed the devastating mobility) could the Sun appear to be stopped in the middle of the Sky, and the shadow retreat into the sundial of Ahaz even if the one and the other are said to have occurred because of the stopping or retrograde movement of the earth. (Therefore the same texts of the Sacred Scriptures, while they are against the devastating mobility, offer nothing which opposes the, I shall say, celestial motions of rotation and translation of the earth, which modern astronomers believe to be undeniable, since their aberration have been recognized by the observations.)

Hanging everything on his invented problem of the "devastating mobility" (NB: Olivieri claiming "Scripture" is "*against* the devastating mobility" even though Scripture mentions nothing about such phenomena) having been answered by Newton's gravity, Olivieri attempts to debunk one of the more famous passages traditionally employed to defend geocentrism, Isaiah 38:11, in which God moved Ahaz's sun dial back by ten degrees. Olivieri's explanation would also apply to Joshua 10:10-14 in which the sun is said to be stopped in the sky for a day. He proposes that instead of the sun being stopped or turned back it is just as feasible for the Earth to be stopped from rotating. It certainly is. But the text says that the sun, not the Earth, was turned back. The burden of proof is on Oliveiri and his generation to prove the converse, especially since the Church for 1800 years prior said that the only proper interpretation of these biblical passages is that God stopped the sun, not the Earth.

Olivieri then tries to slip in a support, as he did earlier, by a reference to the "prepili," which, although it is an obscure Italian word or is misspelled by Brandmüller, appears to be either a reference to stellar aberration or stellar parallax. As we noted in our previous Volumes, stellar aberration was discovered by James Bradley in the 1700s and it was then understood as an additional proof for a moving Earth, as was the stellar parallax presumed to have been discovered by Guiseppi Calandrelli. We now know that both stellar aberration and stellar parallax have their counterpart in the geocentric system, just as every other past purported proof of heliocentrism now has a geocentric counterpart.

> Where the Father Master of the Holy Palace can be taught, and stops wanting to seem a terrible astronomer, bad biblical scholar, Theologian of little judgment, and delinquent Magistrate in office, not that in reality very little respectful to the Holy See in the act that affects to be it, and the inducer of those errors, which it fights with regard to obedience to the Holy See itself, with this strange obstinance, which if it in principle could have been virtuous firmness, now would certainly degenerate into a bad vice. And all should be said without reduction of the high regard, and sincere veneration, which I profess to it.[729]

We have here a glimpse into the real battlefield between religion and science. It did not start between the secular world and the ecclesiastical world; it started right in the halls of the Vatican between prelates holding opposite views. Olivieri, here sounding more like the petulant Galileo than a humble cleric, speaks from a mouth full of pride based on the scientific knowledge he presumes to possess. Religion is fortunate in that it has very little wiggle room to change its views. Science, as Max Planck once told us, changes funeral by funeral. Even before the breath is out of Olivieri's mouth, the scientific facts he so idolizes are busy being overturned by evidence that his Earth cannot be detected moving, for after Arago in 1818, came Fizeau, Fresnel, Hoek, Mascart, Airy, and Michelson over the remaining nineteenth century who provided astounding evidence that Earth was motionless in space. They were followed by Mach, Einstein, Hubble, Born, Hawking, Ellis and many more admitting not only that they had no scientific basis to deny a motionless Earth, but all the evidence indicated the Earth was in the center of the universe. If only Olivieri had waited on God as much as we wanted the Church to wait on science, Settele would have never been honored with an imprimatur. Still, an imprimatur issued by the Church is only a tremor that can be subdued, not an official doctrine overturning eighteen centuries of Catholic tradition.

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[729] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 324.

Perhaps feeling he has the upper hand in this battle, two years later in 1822, Olivieri shows his real hand:

> On September 18 in the current year 1822 , this Supreme Sacred Congregation considered that one would not from now on mark in the decree what it had formulated on September 11, the preceding week of the same month, in regard to the part that considers the removal from the *Index* of the named books by Copernicus, Zuñiga, and Foscarini, expressly named in the Decree of the Holy Congregation of the *Index* of March 5, 1616 until that was recognized, if truly for the sole purpose of teaching the mobility of the earth and the immobility of the Sun, the first two "donec corrigantur" ("while corrected") were suspended and the last was prohibited, that is, even if for some other reason.[730]

As Mayaud notes concerning Olivieri's duplicity:

> One may easily imagine what the deception of Olivieri was in this year 1822. It is important to notice here the "for some other reason," which arises from the "unless something else opposes it" of the last paragraph of the decree of September 11, 1822 ('supra' p. 245).[731] This however would be a scruple of the last

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[730] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, pp. 440-441.

[731] Mayaud here refers to page 245 of his book that records the official Sept. 11, 1822 statement signed by Turiozzi allowing for Settele to receive his imprimatur, but also stating at the end that the books of Copernicus, Foscarini and Zuniga were to be removed from the Index, yet with a note from Turiozzi saying that the

> hour. It should have partly motivated certain cardinals of the Inquisitors for the suspension; or was there something else which had caused the prohibition? It should have been sufficient to respond to them that the decree of 1616, as we have at length shown, presented a completely exceptional character in the formulation, for it explained the motive of the prohibition, the knowing of an 'instruction of the Pythagorean teaching, contrary to the Scriptures' (what none of the decrees of that time did in regard to the prohibited books), and that it did not show anything else![732]

Although the matter is academic due to the fact that the official statement of Sept. 25, 1822 reversed that of Sept. 11, 1822 regarding the removal of Copernicus and the others from the *Index*, the fact remains that the Sept. 11 statement made a provision that Copernicus, Foscarini and Zuniga would not be removed from the *Index* (or they would be put back on the *Index* if previously removed) if something was discovered later that opposed their removal. This includes any new information that would be decisive in determining the truth. For example, if a document were discovered that indicated the 1616 magisterium took into account Kepler's elliptical orbits of the planets, as well as gravity holding air to the Earth's surface, but determined those issues made no difference in their decision to condemn Copernicanism due to the fact Scripture indicated the Earth did not move at all, Olivieri would be forced to give up his crusade for Settele. Or if it might later be found that although gravity holds air to the Earth's surface, it has nothing to do with whether the Earth moves or not; or perhaps if it was discovered that elliptical orbits were not the only or best answer to the revolutions of the planets; or that the sun, even though larger, was not prohibited from orbiting the Earth if the Earth was the center of the universe; or if the "opinion of modern astronomers" on the movement of the Earth was to change, that is, new evidence indicated it was not moving; then these new discoveries would certainly be instances in which "something else opposed" the removal from the *Index* of

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removal was suspended. It is as follows: "(This part of the decree has been suspended, and one should observe afterwards how these works in question are re-examined.) Finally the works of Nicolas Copernicus "De Revolutionibus Orbium Coelestium Lib.VI.," of Paul Antoine Foscarini "Lettera sopra l'opinione de'Pitagorici, e del Copernico della mobilita della terra, e stabilita del sole," of Didacus Astunica "Commentaria in Job" should be omitted in the new edition of the Index of Forbidden Books, unless something else opposes it, according to the form and execution of the decree of the Sacred Congregation of the Index of 1758."

[732] Mayaud, pp. 265-266.

Copernicus, Foscarini, Zuniga, Galileo and Kepler, and would certainly forestall the issuing of any more imprimaturs for books espousing heliocentrism. Suffice it to say that many of the above scenarios have already occurred in science but the Church has been too weak to act upon them.

In any case, Mayaud is pointing out that Olivieri, at the last hour, is merely giving lip service to "something else opposed" that would prohibit Copernicus and his colleagues from being removed from the *Index*. Additionally, Mayaud points out that Oliveiri, if he were to be honest, should have adhered to his original story, namely, that "the decree of 1616…presented a completely exceptional character in the formulation" (*i.e.*, Olivieri claiming it was issued on the basis that Galileo's heliocentric model would not work due to the belief a moving Earth would lose its air, not that it condemned heliocentrism absolutely), and which motivation Olivieri attributed to their insistence on interpreting Scripture literally.

True to form, Olivieri then writes a 20-page thesis on Copernicus, Foscarini, Zuniga, Kepler and Galileo, and submits it on November 10, 1823,[733] a thesis which was written, as Mayaud says, "in order to find this eventual 'for some other reason.'"[734] In retrospect, Olivieri did what most Catholic Galileo scholars do today. Since they are convinced heliocentrism is a scientific fact, their research is always confined to looking "for some other reason" the 1616 and 1633 Church condemned heliocentrism as a formal heresy other than the one and only reason the 1616 and 1633 stated, namely, that "Pythagorean teaching, [is] contrary to the Scriptures." Not surprisingly, today's Galileo scholars give the same specious and presumptuous reasons for their futile search that Olivieri gave. Unfortunately, they work well against a scientifically illiterate populace.

Olivieri then makes one last push to have Copernicus and the others removed from the *Index*. He knows that leaving them on the *Index* completely undermines what he set out to do in seeking the imprimatur for Settele – make heliocentrism an undisputed scientific fact and require the rest of the Church to adopt it as such. As of September 1823, Leo II was now pope. In October 1822, Olivieri published his "reasons" why Copernicus, Zúñiga, Foscarini, Kepler, and Galileo were kept on the *Index* in 1758 and why they should now be removed. The following are excerpts from that pleading:

> It is nevertheless astonishing that these very great men, who had on their shoulders the task of millions of inserted books on the *Index*, have not achieved their work in regard to these particular

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[733] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, pp. 441-462.

[734] "pour y chercher cet éventuel 'pour quelque autre raison'" (p. 266).

> Books [Copernicus Foscarini, Zuniga]. If they had the occasion and the ease to do all the examination, which is now done, who would not hold for certain that they would have recognized as consequence of the general permission the removal from the *Index* of these particular prohibitions, *i.e.* of Galilei [sic, he means Copernicus], Zuniga, and Foscarini, given in example of the general prohibition in the decree of 1616, in which is the same done with the omission of that same general prohibition? In regard to the 'Epitome' by Kepler and the 'Dialogue' by Galilei, their revocation implies their removal, in so far as it is linked clearly to the general interdiction. However there are other prohibited books with the same [general] title. I believe [him] by whom I am assured, although this did not appear to me at first. It is therefore very certain that very famous books of the Copernican teaching, like those by Newton, who is presently already universally followed, have never been prohibited; and yet this famous author had printed at the end of 1686 his work *Philosophiae naturalis principia mathematica* in which he marvelously develops and illustrates such a teaching. I would say now that the motive of the prohibition of these other Books is not as evident, neither as evident, neither as solemn, and consequently their removal from the *Index* is not as much linked to the permission of the Copernican opinion. If there are occasions of particular motives, the Holy See could take them into consideration.[735]

Mayaud has the best critique of Olivieri's rationale:

> …this long and last response of Olivieri, rather confused, to say the truth; however he tries to show once more that the fact of the incomplete removal in 1758 was not deliberate, but more or less an omission, insisting afterwards on the fact that Newton has never been placed on the *Index*, likewise none of the other Copernican books since 1634. This last argument was in fact rather weak, because the original prohibition enclosed them systematically; and if the 'Dialogo' by Galilei necessitated a special measure because of the 'imprimatur' it held, one could ask, why Kepler's book was the object of a special treatment. In this last case we have seen that Ingoli has without doubt a heavy responsibility. On the other hand, the placing on the *Index* in 1739 of the book by Algarotti ('supra' p. 169-170), which was

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[735] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, pp. 479-480.

> an excellent popularization of Newton, manifests how, in spite of the exceptional character of this prohibition, the attitude of the Roman authorities had no value at that time. In this regard the removal of 1757 appears as an entirely unforeseeable and unexpected decision, to be able to explain itself only by a mind of a 'sane and modern philosophy,' by Benedict XIV who held now the supreme authority.[736]

As we noted earlier, the Minim friars who put the disclaimer on Newton's *Principia* (and which disclaimer lasted until 1833 in the Glasgow edition) show that perhaps the Catholic authorities of Olivieri's day were negligent for not putting Newton on the *Index*, but there were at least some influential Catholics at that time who were still giving allegiance to the seventeenth century popes who had prohibited Newton's predecessors.

We also noted that much is made of Benedict XIV being the watershed for the Church's turn toward the heliocentric camp, but no one, including Olivieri, has proven that Benedict intended to allow books to be published that treated heliocentrism as a thesis, nor how he could do so in light of the specific decree in 1620 that only books giving a hypothetical treatment could receive such permission.

In November 1823, the Inquisition asked Olivieri to answer various questions regarding his desire to remove the five books presently on the *Index* (Copernicus, Foscarini, Zuniga, Galileo and Kepler). In December, the Inquisition discussed Olivieri's answers. Here are the concluding notes of that meeting:

> Without place, without time (Rome, 1823 XI)
> Vol. II, p. 749 (draft by unidentified hand)
>
> Copernican System: The Vote regarding the Very Reverend Father Olivieri Commissioner to be joined. Based on the evaluation which the Messrs. Consultors did in the Council of this November 10th on the subject of the Vote of this Very Reverent Father Commissioner on the Copernican System, he laid out an appendix which, together with said Vote, is folded to Your Very Revered Father to be taken into consideration in the council meeting of the first Monday of next December which will take place at exactly 16 o'clock. You will be pleased to pass the entire position to the Very Reverend Father Abbot Cappellari

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[736] Mayaud, pp. 268-269.

> after having considered it, who is requested to bring it back with himself to send it back to the Holy Office.
>
> No. 3 Father Vincenzo da Massa to Father Abbot Cappellari.[737]

We notice here that one of the Consultors in this session of the Holy Office is "Father Abbot Cappellari." This is very significant, since he would go on to become Pope Gregory XVI in 1831, the papal reign in which the books of Copernicus, Foscarini, Zuniga, Galileo and Kepler are taken off the *Index of Forbidden Books* in 1835. The ramifications of Cappellari's involvement in the Settele affair with the decision on the *Index* in 1835 will be taken up in our next section.

By December 1820, the case was returned to the Holy Office who, under Olivieri's direct leadership, decided to approve the imprimatur, which received no objection from the pope. The imprimatur was given to Settele in January 1821. But in April 1822, Pietro Odescalchi sought to publish an extract of Settele's book but Anfossi refused to give him an imprimatur. In September 1822, the Holy Office, still under the leadership of Olivieri, issued a decision forbidding the Master of the Sacred Palace to refuse imprimaturs to books "teaching the movement of the earth and the immobility of the sun." As it stands, Olivieri's plans were to simply go around Anfossi and ignore the stipulation of the Fifth Lateran Council that the Master of the Sacred Palace had sole right to permit the printing of books. Anfossi, fighting Olivieri to his last breathe, rejected the order. The pope, as Mayaud notes, "does not want to get in conflict with Anfossi, on whom he depends permanently." Suddenly, with no recorded discussion, Anfossi finally concedes in November 1822 to release the imprimatur. As Brandmüller notes:

> The Holy Office responded to this measure, with which Anfossi wanted to prevent the release of the *Extract*, by publishing a decree on the 11th of September 1822, in which the Cardinals were banning the then-Master of the Sacred Palace, as well as his successors, from denying the "Imprimatur" for books that taught the motion of the earth and the immobility of the sun. Offenders would be punished. This didn't impress Anfossi much. On the 25th of September he once again gave a negative response to Prince Odescalchi, and when the latter the next day turned to the Council Member of the Holy Office, Monsignor Turiozzi, the Congregation gave orders to the Vicegerent to release his own printing authorization. This happened without delay. But the one

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[737] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 481.

> who lingered now was the printer because he didn't want to come into conflict with Anfossi, since his job highly depended on a good cooperation with the latter. On November 24th Settele was finally able with some satisfaction to write a note on his diary that it was indeed possible, after all, to publish the Extract of De Crollis with the "Imprimatur" of Anfossi. Also Olivieri obviously took part in this farce. After challenging for the umpteenth time Anfossi's arguments in a detailed opinion in the month of August of 1822, Olivieri now started on the offensive by recommending the Congregation to delete from the *Index* also the names of Copernicus, Zuñiga and Foscarini. In their "Feria secunda" of the 2nd of September 1822 the Counselors dealt with the proposal and the result was a unanimous vote in which it was recommended that the Congregation of the Index would proceed accordingly for the new edition of the *Index*.[738]

The historical context of the situation may help in understanding the pressure Anfossi was under as well as the weak response from Pius VII in his defense. By 1820, Pius VII had only been restored to his Vatican home for a mere seven years, after having been incarcerated in Florence from 1809 to 1814 by Napoleon's armies. Several accounts reveal that during this time Pius VII was in ill health and that he seemed somewhat ambivalent about the whole ordeal with Settele. On the one hand, the author of the March 28, 1820 *Acta* refers to Pius VII's acknowledgment of the Holy Office's allowance for Settele's imprimatur; on the other hand he emphasizes what he sees as the "indolence and the dullness of this same Pontiff."[739] That such a scurrilous statement about the pope would appear in the *Acta* is quite surprising, nevertheless, it does suggest that Oliveiri and Grandi were strong-arming both the pope and the Holy Office against Anfossi and taking advantage of the pope's kindness and ill health. As Mayaud notes:

> Now, during the phase of 1822, concerning the publication of an extract of Settele's book in the 'Giornale Arcadico,' an allusion is made several times about the sickness or the state of weakness of the pope, and one cannot underestimate the importance of this

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[738] Brandmüller and Greipl, *Copernico Galilei E La Chiesa*, p. 120.

[739] Mayaud, *Condemnation*, p. 240. The original Latin Mayaud translated is "ultimum praesertim ob ejusdem Pontificis oscitantiam et obstupescentiam." Mayaud also mentions, "However we should consider how Pope Pius VII himself let it go and did not immediately impose his authority. In this same paragraph, had not Turiozzi spoken of 'too much kindness of the Pope'?" (*ibid*., p. 250).

> fact at this time. It is sure that one of the remarkable traits of Pius VII was, as Olivieri says, that "the pope does not want to fight with anyone."[740]

On August 23, 1820, Pius VII told Olivieri that "it was good not to have the decree [in favor of Settele's imprimatur] published, since the impression of the book is a document of weight," with Olivieri commenting, "I have told the pope that now Father Anfossi will yield, and the pope has made a gesture with the hand as a sign of disdain." Of course, Settele, as biased as Olivieri, comments in his diary, "he [Pius VII] did not want to have the decree published in order not to be ridiculed, for the opinion [of the earth's movement] was already for some time established, [and] that in Rome one is not troubled any more about the affair."[741] The point to be made here is that Pius VII continued to show ambivalence, if not reticence, throughout the whole affair. In the final approval of Settele's imprimatur on September 11, 1822, Mayaud notes that Pius VII "who in his unsteady health condition at that time did not think to be obliged to attend it, manifesting thus perhaps his great tendency to compromise."[742]

As noted, just six years prior the Vatican had been turned into little more than a Napoleonic police-state. In his siege of Vatican property, Napoleon had confiscated all the documents dealing with Galileo's trial and had them put in a library in France. They were not returned until 1843, by happenstance. Hence, in the period between 1820-1835, when the Vatican was making crucial decisions regarding the matter of Galileo and heliocentric cosmology, it had no access to the very documents the Church had published between 1616 and 1633. It is in the context of such governmental upheaval and a vacuum of documentation that Settele's imprimatur is issued in 1822 and Galileo's name is removed from the Index in 1835.

The missing historical records become a very significant factor in light of the fact that the Congregation of the Index had already gone on record in 1765 in the case of Joseph Lalande by stating that Galileo's *Dialogo* could not be approved unless the condemnation issued at his trial in 1633 was rescinded.[743] Faced with no direct documentation of Galileo's trial, the Inquisitors of the Settele affair could only consult the 1758 decision under Benedict XIV. As Finocchiaro puts it:

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[740] Mayaud, *Condemnation*, p. 251, with references from Settele's diary concerning the "weakness" entered in April 12, August 10 and October 13, 1822; and concerning "does not want to fight" entered June 6, 1820.

[741] *Ibid*, p. 252, taken from Settele's diary entry of January 20, 1822.

[742] *Condemnation*, p. 253.

[743] As Finocchiaro puts it: "But he [Lalande] was told by the head of the Congregation of the Index that Galileo's case was different because it involved a trial, and so one would first have to revoke the sentence pronounced against him…" (*Retrying Galileo*, p. 154).

> The Inquisition, unable to consult the file of Galilean trial documents that had gone missing after the Napoleonic transfer, did the next best thing; it requested the Congregation of the Index to provide the file on the 1758 edition of the Index, which contained the partial and silent retraction of the anti-Copernican ban of 1616. The Index delivered the file to the Inquisition on March 28 [1820]. In the meantime, newspapers in Germany, France, and Holland were publishing articles about this ecclesiastical censorship.[744]

Without the historical records of 1616 and 1633, we might say that the 1820 Inquisition was hobbling on one leg and perhaps should have postponed their decision until the records could be retrieved. Perhaps Olivieri would not have been so quick to impose his "devastating mobility" or "elliptical orbits" excuses into the reasons Galileo's heliocentrism was condemned since, with the 1616 and 1633 records on hand, it would have been easy for the Consultors to see that the seventeenth century magisterium entertained no such fanciful notions. Instead, as the quote above reveals, the European newspapers were creating undue pressure on the Vatican, complaining of censorship against Settele and clamoring for a favorable decision toward Copernican cosmology.

Although Finocchiaro refers to the 1758 decision as a "partial and silent retraction of the anti-Copernican ban of 1616," this assessment is misleading for, as we noted previously, not only were the names of Copernicus, Foscarini, Zúñiga, Kepler and Galileo kept on the *Index* precisely because they were condemned for teaching heliocentrism, more importantly, there was no specific provision made in 1758 (and Finocchiaro does not cite one in his book) which stated that "all books teaching the earth's motion and the sun's immobility" could now present heliocentrism *as a thesis rather than a hypothesis*, a fact not readily admitted by Galileo historians. Logically, it would be self-contradictory for the 1758 *Index* to continue the ban on Copernicus, Foscarini, Zúñiga, Kepler and Galileo for teaching, as a thesis, that the Earth moves, but then allow "all [other] books" the privilege to do the exact opposite with impunity. Moreover, if the *Index*, both in 1758 and on through to 1820, approved of no treatise that regarded Copernicanism as a thesis, on what precedent could the 1820 Inquisition approve Settele's book which treated heliocentrism as a thesis? The wording of the 1820 decision indicates that it was bound by what was decreed in 1758. It states:

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[744] *Retrying Galileo*, p. 195.

> Their Eminences have decreed that, for the time being, now and in future, a license is not to be refused to the Masters of the Sacred Apostolic Palace for the printing and publication of works dealing with the mobility of the earth and the immobility of the sun according to the common opinion of modern astronomers, as long as there are no other contrary indications, on the basis of the decrees of the Sacred Congregation of the Index of 1757 and of this Supreme Holy Office of 1820.[745]

Since the 1758 decision did not make any provision to treat Copernicanism as a thesis, it should have served as a "contrary indication" to the Inquisitors of 1820, warning them against approving thesis-laden Copernican treatises. Somehow, however, the "contrary indications" were side-stepped between the years of 1820 and 1835. Interestingly enough, in Olivieri's lengthy Summation to the Inquisition in 1820 for the purpose of persuading it to approve Settele's *Elements of Astronomy*, he faults Anfossi, claiming that Anfossi "cannot be excused for ignoring the *Index* that has been in force since 1758 and declaring prohibited books that certainly are no longer such."[746] But since in 1758 neither the books that already presented heliocentrism as a thesis were excused (*viz*., Copernicus, Foscarini, Zúñiga, Kepler and Galileo), nor was there any specific provision to allow "all [other] books" to treat heliocentrism as a thesis, it seems that Olivieri is the one "ignoring" the 1758 decision, or at least reading into it more than what is there.

More Detail on the 1820-1822 Decisions

In light of these scientific facts, and the overriding concern expressed by Fr. Anfossi that "these gentlemen…try to tell us that what is stated many times by the Holy Spirit is false, but that what their stellar parallax and aberration tell them is true," we need to examine more closely the precise wording that was employed by the 1820 and 1822 decisions. There were two decisions because Fr. Anfossi protested the first issued on August 16, 1820, and thus a second one was issued in 1822 to which Fr. Anfossi acceded. The first states:

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[745] "E.mi DD. Decreverunt, non esse a praesenti et futuris pro tempore Magistris Sacri Palatii Apostolici recusandam licentiam pro impressione et publicatione operum tractantium de mobilitate terrae et immobilitate solis iuxta communem modernorum astronomorum opinionem, dummodo nihil aliud obstet, ad formam Decretorum Sacrae Congregationis Indicis anni 1757, et huius Supremae anni 1820" (Antonio Favaro*, Galileo e l'Inquisizione,* pp. 30-31).

[746] From Olivieri's November 1820 Summation, titled, "Ristretto di Ragione, e di Fatto," ¶29, as cited by Finocchiaro in *Retrying Galileo*, p. 205.

> Concerning the request of the Professor Giacomo Settele…for permission to print his work on the doctrine of the mobility of the earth, denied to him by the Master of the Sacred Apostolic Palace…it is ordered that someone of the consultors write on the posture to be taken in this matter so as to safeguard the good name of the Holy See decreed according to the opinion of the Father Consultor [Antonio Maria Grandi] who had written: "There is nothing contrary to the fact that one might defend the opinion of Copernicus on the motion of the earth in the manner in which today it is usually defended by Catholic authors; and as to the meaning [of this decision]: it means that it be suggested to the Most Reverend Master of the Sacred Apostolic Palace [Fr. Anfossi] that he not prevent the printing of the *Elements* [*of Astronomy*] of the canon Giuseppe Settele; and then that it be suggested to Settele to insert in the said work some things whereby he shows that the Copernican opinion, as it is presently defended, is no longer subject to those difficulties to which it was liable in times gone by, before the observations which were subsequently completed.[747]

The second, issued on September 11, 1822, states:

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[747] *Le Opere di Galileo Galilei*, vol. 19, p. 420, as translated by Fantoli's *Galileo: For Copernicanism and for the Church*, pp. 520, 498. Latin is: "Feria IV. Die 16 Augusti 1820. Circa petitionem Professoris Iacobi Settele, a SS.^{mo} remissam huic S. Congregationi, pro permissione impressionis sui operis super doctrina mobilitatis terrae, sibi denegata a P. M. S. Palatii Apostolici…rescriptum fuit quod scribat aliquis ex DD. Consultoribus circa temperamentum hac in re sumendum ad tuendam decentiam S. Sedis, lecto voto R. P. M. Antonii Mariae Grandi, E.^{mi} DD. Decreverunt iuxta votum P. Consultoris qui scripsit, nempe: « Nihil obstare, quominus defendi posit sentential Copernici de motu telluris eo modo quo nun cab auctoribus Catholicis defendi solet; et ad mentem: Et mens est, ut insinuetur R.^{mo} P. Magistro Sacri Palatii Apostolici ne impediat editionem Elementorum Canonici Iosephi Settele; Canonico autem Settele insinuetur ut ipso in opere nonnulla inserat, quibus ostendat, sententiam Copernicanam, ut modo defenditur, non amplius iis difficultatibus esse obnoxiam, quibus, ante posteriora observata, antiquis temporibus implicabatur »" (*Galileo E L'Inquisizione*, pp. 30-31).

> The most excellent [cardinals] have decreed that there must be no denial, by the present or by future Masters of the Sacred Apostolic Palace, of permission to print and to publish works which treat of the mobility of the earth and of the immobility of the sun, according to the common opinion of modern astronomers, as long as there are no other contrary indications, on the basis of the decrees of the Sacred Congregation of the Index of 1757 and of this Supreme [Holy Office] of 1820; and that those who would show themselves to be reluctant or would disobey, should be forced under punishments at the choice of [this] Sacred Congregation, with derogation of [their] claimed privileges, where necessary.[748]

In analyzing the 1820 and 1822 decrees more closely, we will see many interesting twists and turns. Note the following:

1) Although the Settele affair began with the assertion from Settele that his book spoke of heliocentrism as a thesis and not as a hypothesis, there is no specific recognition of that fact from the Congregation of the Index. The Congregation refers only to "his work on the doctrine of the mobility of the earth." Neither is there a statement from the Congregation that future books which present heliocentrism as a thesis can be published. The first decree refers only to "the manner in which today it is usually defended by Catholic authors," but does not specify that these authors were treating heliocentrism as a thesis or fact. Since, as we have noted previously by the disclaimer of Le Seur and Jacquier against Newton's heliocentrism as late as 1833, at this time in history there obviously existed official defenders of the Earth's immobility. The second decree refers to future publications as

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[748] *Le Opere di Galileo Galilei*, vol. 19, p. 421, as translated by Fantoli's *Galileo: For Copernicanism and for the Church*, p. 498. Latin is: "Feria IV. Die 11 Septembris 1822. E.^{mi} DD. Decreverunt, non esse a praesenti et futuris pro tempore Magistris Sacri Palatii Apostolici recusandam licentiam pro impression et publication operum tractantium de mobilitate terrae et immobilitate solis iuxta communem modernorum astronomorum opinionem, dummodo nihil aliud obstet, ad formam Decretorum Sacrae Congregationis Indicis anni 1757, et huius Supremae anni 1820; reluctantes et inobedientes, praevia, quatenus opus sit, derogatione praetensorum privilegiorum, coercendos esse poenis arbitrio S. Contregationis. Et Praesens Decretum communicetur tum E.^{mo} Urbis Vicario, tum E.^{mo} Praefecto S. Congregationis Indicis, tum P. M.^{ro} Sacri Palatii Apostolici. F. Turiozzi Ass." (*Galileo E L'Inquisizione*, p. 31).

"works which treat[749] of the mobility of the earth," not those which will regard the mobility of the Earth as a thesis or fact.

2) In the 1820 statement, Copernicanism is never referred to as a fact or thesis but only as an "opinion" (*e.g.*, "the opinion of Copernicus," and "the Copernican opinion," cited in the first decree). Likewise, in the second decree of 1822, the heliocentric cosmology then advocated by various scientists is never referred to as a fact or thesis, but only as an "opinion" (*e.g.*, "the common opinion of modern astronomers"). An opinion is not a fact or thesis. It is closer to a hypothesis or a theory. As such, the Congregation of the Index seems to be saying that, as an official institution of the Catholic Church, it is not, and will not, advocate heliocentrism as a scientific fact, but if a Catholic author desires to formulate arguments to the contrary he may do so, and, of course, he does so at his own risk. As such, the permission to print Settele's book is never said to be granted on the basis that the Index recognizes heliocentrism as a fact or thesis, but only as the "Copernican opinion, as it is presently defended…" Since both Copernicus' and "modern astronomers'" treatment of heliocentrism is nothing more than their respective opinions, then obviously Settele's advocacy of heliocentrism cannot be considered any more than an opinion, regardless of whether he, himself, believes it to be a thesis or fact.

3) The first decree relies on Olivieri's dubious argument that the 1616-1633 decrees against heliocentrism are now obsolete because Copernicus and Galileo claimed the sun was motionless; did not use elliptical orbits for the planets; and could not explain how the Earth's air would stay intact if the Earth moved. Yet the second decree fails to recognize that very distinction since it mistakenly refers to the "common opinion of modern astronomers" as holding to the "immobility of the sun." It appears in this case that the left hand does not know what the right hand is doing. Be that as it may, we noted earlier that neither a moving sun nor elliptical orbits prove heliocentrism. Hence, the fact that the Congregation of the Index, being led by Olivieri as its Commissary General, was persuaded to base its decision on Olivieri's specious analysis of the 1616 and 1633 decrees, exposes the dubious nature of the whole proceeding.

4) From the first decree it is apparent that one of the primary concerns of the "Holy See" is that its "good name" is "safeguarded." Although it

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[749] Latin: *tractantium*, meaning treat, discuss, handle, or manage.

is admirable for the accused to preserve its good reputation in the face of unproven allegations, it seems that the pressure from the world to accept heliocentrism may have unduly forced the Congregation of the Index to accept Olivieri's specious argumentation to relieve itself of the 1616-1633 decrees. To borrow a contemporary phrase, it was the 'politically correct' way of dealing with the problem.[750]

5) The first decree excuses Settele based on the assumption that science has demonstrated heliocentrism by "observations which were subsequently completed" (*e.g.*, the observations of stellar aberration and stellar parallax). As we noted, however, modern astronomy, long after the limited knowledge of Settele, Olivieri, Newton and Kepler, reveals that neither stellar aberration nor stellar parallax proves heliocentrism, since both phenomena can be explained quite adequately from the geocentric system. Fortunately, the conditional basis for providing imprimaturs to books which advocate the heliocentric system was added when the 1822 decree recognized the possibility that among "modern astronomers" there may exist in the future "contrary indications" which would forestall the permission to publish heliocentric works. Since modern science has since shown that Olivieri's cosmological arguments are wrong, the Church possesses the "contrary indications" upon which to rescind any imprimatur previously given to a book advocating heliocentrsim.

Conclusion from the Settele Affair

All in all, with the fallacious arguments that Olivieri submitted in his Summation, the Congregation of the Index was grossly ill-advised when it came time to deciding whether to grant an imprimatur to Canon Settele. Under such duress and false information, the whole affair is tainted from start to finish. Olivieri may have been successful in obtaining an imprimatur for Settele but this did not mean the Church's condemnation of heliocentrism had been rescinded. Imprimaturs given to private books have no authority in overturning Congregational decrees approved by supreme pontiffs and/or facilitated by a canonical trial, as was the case in both 1616 and 1633. In face of the fact that the permission initially given to Galileo's *Dialogo* was later rescinded by the 1633 magisterium because it found the imprimatur was issued under false pretenses, makes the Settele imprimatur more an anomaly than a precedent. In addition, Copernicus, Zúñiga, Foscarini, Kepler, and Galileo remained on the Index. Hence, the Settele affair proved only one thing, namely, that a high-placed cleric could convince his peers with pretentious scientific claims that neither he nor they could prove since the science of cosmology was still in its infancy. As we noted in the case of Bradley versus Airy, science would not mature nearly enough to shed sufficient light on Olivieri's claims until long after he and his contemporaries had died. And when it shed its light, it would show that Olivieri's claims were fallacious.

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[750] Some Galileo historians, who are themselves heliocentrists, applaud Olivieri's invented arguments as "the definitive solution to the Galileo case," as is advanced by Walter Brandmüller in *Galileo e la Chiesa ossia il diritto ad errare*, 1992, p. 184. Fantoli disagrees, saying, "I am not able to share in any way his [Brandmüller's] final judgment…." (*Galileo: For Copernicanism and for the Church*, p. 521). Finocchiaro makes a noteworthy point that Olivieri was forced to this *ad hoc* solution because both he and Anfossi understood the 1616 and 1633 "decrees were unrevisable, since the earth's motion had been condemned once, there could not be another decree withdrawing or revising the first" (*Retyring Galileo*, p. 220).

As for Pius VII's role in the Settele affair, although there are various accounts that, after receiving Olivieri's report, he helped smooth the pathway for Settele to obtain the imprimatur, no document exists containing a quote directly from Pius VII endorsing either Settele or heliocentrism.[751]

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[751] After giving the history of the evidence submitted by both Settele and Olivieri to Pius VII in favor of Settele; and the evidence against Settele submitted by Anfossi and the Vatican majordomo, the best Finocchiaro can conclude is: "On December 14 [1820], the Inquisition cardinals agreed that the imprimatur would be given by the vicar apostolic, and the pope approved the decision" (*Retrying Galileo*, p. 197, citing "Brandmüller and Greipl 1992, pp. 93-93, 396" as his source but without a direct quote from Pius VII), and "On September 25 [1822], Pope Pius VII ratified the Inquisition's decision to permit works teaching the earth's motion" (*Retrying Galileo*, pp. 197-198, citing Favaro's, *Le Opere di Galileo Galilei*, vol. 19, p. 421 and Brandmüller and Greipl 1992, p. 429, but again without a direct quote from Pius VII from either source). Fantoli states: "This decree [of Sept. 11, 1822] was approved two weeks later by Pope Pius VII" (*Galileo: For Copernicanism and for the Church*, p. 499). Favaro's citation of the "approval" has one short sentence signed not by Pius VII but by the Assessor, monsignor F. Turiozzi: "Sanctissimus Dominus Noster Pius divina providential Papa Septimus, in solita audientia mihi infrascripto Assessori Sancti Officii impertita, supradictum Decretum approbavit, et exequi mandavit. F. Turiozzi Ass.," which translates: "During the accustomed audience granted to me [F. Turiozzi], the undersigned Assessor of the Holy Office, Our Most Holy Lord Pius the Seventh, by divine Providence pope, approved the above decree and ordered it to be executed" (*Galileo E L'Inquisizione*, p. 31; Mayaud, *Condemnation*, pp. 245-246). There is no document, however, that contains an exact quote of Pius VII's approval, nor has a signature of Pius VII been produced for decisions that are said to be "ratified" by him.

The 1835 Index of Pope Gregory XVI

The second session of the Consultants took place on December 1, 1823. Here again the decision was postponed on what to do with the books presently on the *Index*. Olivieri did not choose to bring up the issue with the new pope, Leo II (1823 – 1829) or his successor Pius VIII (1829 – 1830). By 1831, however, the mood had changed with the election of Gregory XVI.

As noted, in October 1822 Olivieri published his "reasons" why Copernicus, Zúñiga, Foscarini, Kepler, and Galileo were kept on the *Index* and why they should now be taken off. In November, the Inquisition asked him to answer various questions regarding his thesis. In December, it discussed Olivieri's answers with the help of two other experts, B. Garofalo and Bartolomeo Cappellari. Their names are listed on the record of the Vote of the Consultors:

> VOTE OF THE CONSULTORS
>
> Without place (Rome, 1823 XI)
> Vol. I, foliio, 339v (autograph by Cuneo-Ornaro, assessor)
>
> Domini Consultores fuerunt in Voto rescribendi Dilata, et eadem Positio iterum distribuatur. Dominis Consultoribus, cum observationibus exarandis a **R. Patribus Cappellari, et Garofalo**.[752]

Although there are no historical records with the results of that discussion, we can assume that Bartolomeo Cappellari carried them in his mind when he became pope in 1831 as Gregory XVI. It is obvious that there is an intimate connection between what Gregory XVI did in 1835 and what he as Cappellari had already approved in 1823. Two years after he was elected, on May 20, 1833, apparently on little more than Olivieri's argumentation presented at the December 1823 meeting and approved by the Consultors, Gregory XVI, or someone under him, decided that the new *Index of Forbidden Books* would omit the works of Copernicus, Zúñiga, Foscarini, Kepler, and Galileo. It was no doubt the final stroke of the Olivieri crusade and the very accomplishment of what the Consultors had explicitly denied to Olivieri in 1823. The equivocation speaks for itself.

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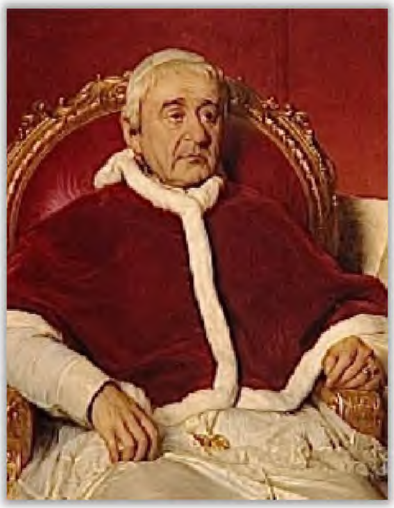
[752] Brandmüller and Greipl, p. 481. "The Lord consultors were in the undertaking for the purpose of replying to those things which differed, and the same layout was distributed to the Lord Consultors, with observations being made by the Reverend Fathers Cappellari and Garofalo."



Pope Gregory XVI

Gregory XVI's decision was made in the face of such incidents as astronomer Giuseppe Piazzi declaring in 1827 that "the Copernican system was not as certain and well demonstrated as commonly believed,"[753] and Le Seur and Jacquier's continuing *Declaratio* on Newton's *Principia* in the Glasgow edition of 1833, which read "…But we profess obedience to the decrees made by the Supreme Pontiffs against the movement of the earth."[754] But it was also made, as Finocchiaro notes, in the midst of incidents such as the "Spanish bishop who consulted the Roman Inquisition about whether the Copernican system could be maintained, and instead of a definite answer he was sent the recent rulings stemming from the Settele episode."[755]

The account of the removal of the books comes, as Mayaud notes, "from Degola, the new secretary of the Congregation of the *Index*, and can be found in Volume I, 19, of the *Acta*. On May 20, 1833, Degola met with Gregory XVI to present the new edition of the *Index*, dated January 29, 1833. He presented the following introduction to the pope:

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[753] *Retrying Galileo*, p. 198, as cited from Settele's diary, *op. cit.*, p. 421.

[754] Original Latin: "DECLARATIO....Cæterum latis a summis Pontificibus contra Telluris motum Decretis nos obsequi profitemur." Above translation taken from Rev. William W. Roberts in *The Pontifical Decrees Against the Doctrine of the Earth's Movement*, p. 53.

[755] *Retrying Galileo*, p. 198.

> Whereas on Wednesday, September 11, 1822, the Supreme Congregation of the Holy Office had sent a decree authorizing the works about "The Mobility of the Earth and the Immobility of the Sun according to the common opinion of modern astronomers," a decree which had been communicated to His Most Eminence, the Vicar of Rome, to His Excellency, the Prefect of the Index, and to His Excellency, the Master of the Sacred Palace, [this] with the express approbation of Pius VII about the Holy Dissertation of September 25 of the same year, [and whereas] this decree has been signified by the mentioned Holy Congregation out of Rome to the bishops who had asked about this subject. Accordingly the Father Secretary made a reference about it in the new Index. Now the appropriate place is in the addition of the Index of Benedict XIV under the title "Decrees on the Subject of Prohibited Books which are Not Expressly Quoted in the Index" at the end of #II, "Prohibited Books on Definite Subjects" with the following memorandum.
>
> Additio: The books dealing with the mobility of the earth and the immobility of the Sun according to the common opinion of modern astronomers are permitted by the Decree of the Supreme Congregation of the Holy Office of Wednesday, 11 September 1822. The Father secretary of the Index also believed it best if in a critical part of the Decree of 23 August, 1634 on Galileo Galilei's *Dialogo sopra I due massimi Sistemi del Mondo, Tolemaico et Copernicano*, this addition might be made: "Nevertheless, it is permitted according to the Paduan edition of 1744, *cf.* decree of the Holy Office 9/10/1741" but this addition in the Index of the year 1758 was rashly omitted by subsequent editions.[756]
>
> His Holiness, having read this report, has ordered in response to the Father Secretary that in the new edition the authors, dealing with the mobility of the earth and the immobility of the sun, like

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[756] Latin: Libri tractantes de mobilitate terrae et immobilitate Solis juxta commune modernorum astronomorum opinionem permittuntur Decreto Supremae Congregationis Sancti Officii feriae IV, 11 Sept. 1822. Pater Segretarius Indicis optimum quoque crederet si in articulo Galileo Galilei, *Dialogo sopra i due massimi Sistemi del Mondo, Tolemaico et Copernicano. Decr. 23 Augusti 1634*, haec additio fieret "juxta editionem tamen Patav. 1744 permittitur, Dec. Sti. Of. 9/10/1741," quae addition in Indice anni 1758 et posterioribus inconsulto omissa est.

> Galilei, Copernicus, *etc*., should be omitted. However one should not attach any judgment about this case. Concerning the edition of the Index, which was presented to him, he ordered it to be done thoroughly and to be published.[757]

Mayaud makes an interesting note about Degola:

> ….the text proposed by him [Degola] remains despairingly narrow-minded, since the quotation of the decree limits the non-prohibition of the books which deal with the problem of the world system "according to the common opinion of modern astronomers" and therefore do not consider in any way the older writings which dealt with this problem according to Copernicus. In his analysis of the situation Degola finally stands completely on the side of those who have hindered Olivieri in 1823 to obtain the complete removal.[758]

By "text," Mayaud is referring to the "Additio" that Degola selected. This "text," as Mayaud sees it, was Degola's attempt to undermine Olivieri's work, and he did so with a "good knowledge of the documents" including "the *Stanza Storica E a-5* where one can find the decree of September 1822, not contained in the volume of the Decreta of the Holy Office." Although the motivation of Degola is obscure, apparently he sought to separate the Galileo issue from the Copernican issue, whereas Olivieri sought to bind them together and explain the problem as being nothing more than the "devastating mobility" and elliptical orbit issues.

It didn't make any difference in the end, of course, since Gregory XVI decided in favor of removing the five books. As Mayaud sees it, "A hypothesis presents itself directly: Gregory XVI, when he was consultant of the Holy Office in 1823, understood the situation exactly as Olivieri did…" Settele says much the same in his diary: "the pleasant remarks of Cappellari, with his 'let the earth turn' are a sign of his complete agreement with Olivieri."[759] Settele is referring to the remark he heard Gregory XVI say in his 1833 audience: "…to turn the head or turn the earth? …but, let me turn the earth so that they cannot turn their head…"[760] Accordingly, the last entry in Brandmüller and Greipl's book, *Copernico Galilei E La Chiesa*, is Olivieri's, who wrote and signed the following sometime after 1835:

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[757] Mayaud, *Condemnation*, pp. 271-272.

[758] *Ibid*. p. 273.

[759] "Une hypothèse se présente aussitôt: Grégoire XVI, alors qu'il était Consulteur du Saint-Office en 1823, percevait la situation exactement comme Olivieri….les remarques plaisantes de Cappellari, avec son 'laissez tourner la terre,' sont un indice de son accord complet avec Olivieri" (*ibid*., p. 273).

> After such erroneous teachings were corrected after the gravity of air was discovered and properly appreciated; with the accumulation of the astronomical data with tireless observations and meditations, the Holy See—which already from the first examination had permitted the hypothesis—at first did not progress to make the scholars mistrustful; then it became, with the passage of time, at the decrees of indulgence of 1757, 1820, 1822 finally after the printing of the *Index* of 1819 then following the very new one of 1835, the authors who by name had been prohibited or suspended as a result of the doctrine of the mobility of the earth in 1616, 1619, 1620, 1633 did not appear, the need to keep them no longer being considered.[761]

Maurizio Benedetto Olivieri, the point man for the whole ordeal, reveals by his words, "after the gravity of air was discovered and properly appreciated; with the accumulation of the astronomical data with tireless observations" what was behind it all. The simple fact is the Church became intimidated by the claims of science and decided to sacrifice her tradition and her legacy for the pottage of the "opinions of modern astronomers" whose theories and observations no one could prove one way or the other. Olivieri, who had probably been whispering in the ear of Gregory XVI since 1823 and who died within a year of the pope in 1845, made the issue depend on the opinions of science from the beginning. Anfossi, faithful Catholic that he was, was unequipped to deal with Olivieri on that level, and Olivieri knew it, and he then convinced Cappallari of it.

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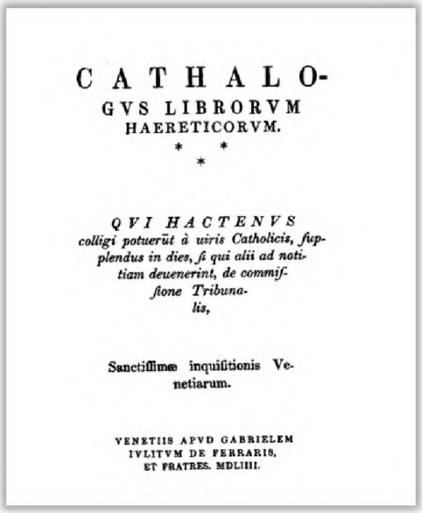
[760] Brandmüller and Greipl, p. 129. Italian: "Cappellari, l'esperto di un tempo e ora papa Gregorio XVI, poteva per esempio chiedere sorridendo al professor Settele in occasione di una udienza nel 1833: …gira la testa o gira la terra? ….ma lasciate che giri la terra, basta, che non girino le teste."

[761] Headed with: "Maurizio Olivieri on the End of the Copernicus-Galilei Case: Extracted from a manuscript titled 'Conduct of the Holy See toward Copernicus and Galilei,' without place, without date, without pagination (Rome, after 1835), Vol. II (autograph of Olivieri)." Italian: MAURIZIO OLIVIERI SULLA FINE DEL CASO COPERNICO-GALILEI: Estratto da un manoscritto intitolato Condotta della S. Sede verso Copernico e Galilei Senza luogo, senza data, senza paginazione (Roma, dopo il 1835) Vol. II (autografo di Olivieri): All' essersi dopo corretti tali erronei insegnamenti dopoche fu scoperta la gravita dell' aria, e convenevolmente apprezzata: all'essersi accresciuti i dati astronomici con infaticabili osservazioro, e meditazioro, primieramente la S. Sede che gia fino primo esame aveva permessa l'ipotesi, non progredo a mettere ulteriormente in diffidenza gli studiosi; quindi devenne colla successione del tempo, ai decreti di indulgenza del 1757, 1820, 1822 finalmente dopo la stamp a dell'Indice del 1819 essendo susseguita quella novissima in essa 1835, non apparirono gli autori nominatamente proibiti o sospesi a cagione della dottrina della mobilita della terra nel 1616, 1619, 1620, 1633, niun bisogno pitt essendovi di ritenerli."

That Gregory XVI would stoop to removing these condemned books without so much as a word of explanation suggests that he was not acting with much circumspection, sweeping the issue under the rug instead of dealing with it directly. After two centuries of dialogue, decrees, condemnations and worldwide brouhaha initiated by one of the highest profile events in the Church's history (*i.e.*, the silencing and condemnation of Galileo and heliocentrism between 1616 and 1633), all Gregory XVI provides for his flock is silence, but which, in reality, is an utter disrespect for his patrimony and papal predecessors. Although Gregory lavished praise on the "opinions of modern astronomy," he did not provide one word of explanation or consolation for his unprecedented upheaval of Catholic tradition and authority. Did he think that by not providing an explanation no one would question the blatant contradiction he set up between himself and Paul V and Urban VIII? Were we supposed to pretend we didn't notice that he made his papal predcessors, not to mention the Church Fathers, the Council of Trent and its Tridentine Catechism, to be ignorant fools who were not smart enough to figure out that not only do the "opinions of modern astronomers" somehow have the last word in determining Catholic teaching, but the Church should have never entered the arena in the first place with claims that Scripture must be interpreted literally as the Church had always done? What a travesty beyond belief. Cappellari took Olivieri's deceptive "science" bait hook, line and sinker in 1823; and he apparently couldn't wait to make it official in clandestine silence in 1835. He probably thought he made the Church twice as strong, but in reality he only made it a hundred times as weak, for now we are saddled with a Church that contradicts herself – a much bigger problem than contradicting the claims of science. Interestingly enough, within this hot crucible Gregory engaged in mere hand-waving, as did Pius VII with Settele, by not signing any document or the Index to verify his decision. He merely had his underlings remove the five books. Apparently, we are then supposed to figure out the reason for his decision on our own; or, perhaps, Gregory was indicating that he had no good reason for removing them, which meant that he was acting under duress or that the decision could easily be reversed in the future, just as Galileo's imprimatur had been reversed. In either case, the proper protocol was ignored.



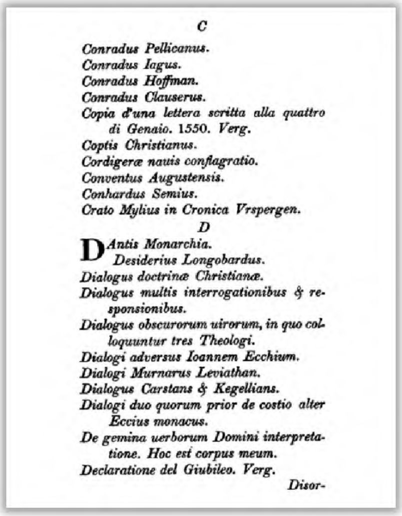
C A T H A L O-
GVS LIBRORVM
HAERETICORVM.

* *
*

QVI HACTENVS
colligi potuerūt à uiris Catholicis, ſupplendus in dies, ſi qui alii ad notitiam deuenerint, de commiſſione Tribunalis,

Sanctiſſimæ inquiſitionis Venetiarum.

VENETIIS APVD GABRIELEM
IVLITVM DE FERRARIS,
ET FRATRES. MDLIIII.



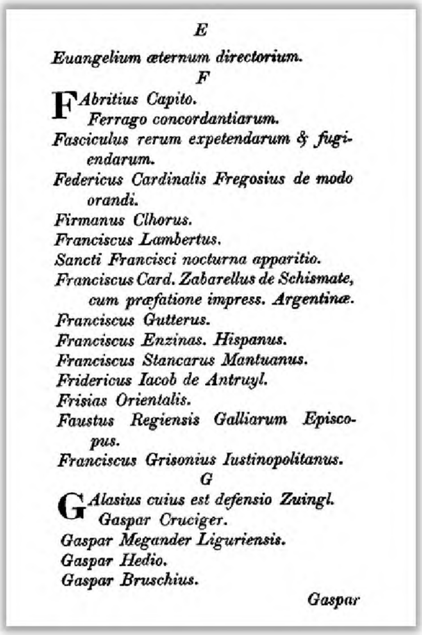
C

Conradus Pellicanus.
Conradus Iagus.
Conradus Hoffman.
Conradus Clauserus.
Copia d'una lettera scritta alla quattro di Genaio. 1550. Verg.
Coptis Christianus.
Cordigeræ nauis conflagratio.
Conventus Augustensis.
Conhardus Semius.
Crato Mylius in Cronica Vrspergen.

D

DAntis Monarchia.
Desiderius Longobardus.
Dialogus doctrinæ Christianæ.
Dialogus multis interrogationibus & responsionibus.
Dialogus obscurorum uirorum, in quo colloquuntur tres Theologi.
Dialogi adversus Ioannem Ecchium.
Dialogi Murnarus Leviathan.
Dialogus Carstans & Kegellians.
Dialogi duo quorum prior de costio alter Eccius monacus.
De gemina uerborum Domini interpretatione. Hoc est corpus meum.
Declaratione del Giubileo. Verg.

Disor-



E

Euangelium æternum directorium.

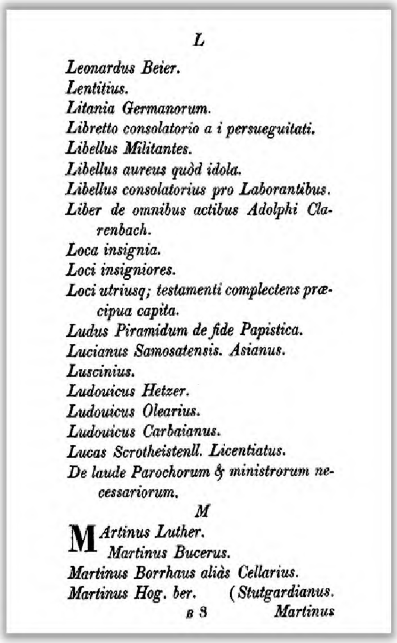
F

FAbritius Capito.
Ferrago concordantiarum.
Fasciculus rerum expetendarum & fugiendarum.
Federicus Cardinalis Fregosius de modo orandi.
Firmanus Clhorus.
Franciscus Lambertus.
Sancti Francisci nocturna apparitio.
Franciscus Card. Zabarellus de Schismate, cum præfatione impress. Argentinæ.
Franciscus Gutterus.
Franciscus Enzinas. Hispanus.
Franciscus Stancarus Mantuanus.
Fridericus Iacob de Antruyl.
Frisias Orientalis.
Faustus Regiensis Galliarum Episcopus.
Franciscus Grisonius Iustinopolitanus.

G

GAlasius cuius est defensio Zuingl.
Gaspar Cruciger.
Gaspar Megander Liguriensis.
Gaspar Hedio.
Gaspar Bruschius.

Gaspar



L

Leonardus Beier.
Lentitius.
Litania Germanorum.
Libretto consolatorio a i persueguitati.
Libellus Militantes.
Libellus aureus quòd idola.
Libellus consolatorius pro Laborantibus.
Liber de omnibus actibus Adolphi Clarenbach.
Loca insignia.
Loci insigniores.
Loci utriusq; testamenti complectens præcipua capita.
Ludus Piramidum de fide Papistica.
Lucianus Samosatensis. Asianus.
Luscinius.
Ludouicus Hetzer.
Ludouicus Olearius.
Ludouicus Carbaianus.
Lucas Scrotheistenll. Licentiatus.
De laude Parochorum & ministrorum necessariorum.

M

MArtinus Luther.
Martinus Bucerus.
Martinus Borrhaus aliàs Cellarius.
Martinus Hog. ber. (Stutgardianus.

B 3 *Martinus*

Pages from the 1835 *Index of Forbidden Books*. From top left to right:

(1) title page;
(2) page which no longer contains the name of Copernicus;
(3) page which no longer contains the name of Galileo;
(4) page which retains the name of Martin Luther

Mayaud, who is himself a heliocentrist and thus favors the 1835 *Index,* tries to defend Gregory's breach with tradition by saying "the pontificate of Gregory XVI (1830-1846) was profoundly marked by an opposition to the liberal movements, which now spread all over Europe following the revolution of July 1830 in France, and that we have no direct witness at all of him being open to 'a sound but modern philosophy.'"[762] Perhaps it never crossed Mayaud's mind that it was shortly after 1758 when, as Mayaud claims, Benedict XIV allowed books teaching the heliocentric view, that the first stage of the French "revolution" came upon Europe three decades later in 1789; and it was the second phase of that revolution that came in 1830, just seven years years after Settele received his imprimatur and became the benchmark for the Church's capitulation to science. It was only two decades more that Darwin in 1859 came with his newfangled evolution; and James and Freud with their psychology and psychoanalysis; and the Church was virtually powerless to stop them after their poster boys, Galileo and Copernicus, were exonerated in the 1835 *Index*.

Mayaud's effort to paint Gregory XVI as one who "opposed liberal movements" is quite a stretch. Liberalism was not the only problem for the Church at this time. In this little crucible between 1758 and 1835, Scientism became the new and formidable foe that, although it often ate at the same table as Liberalism, was an authority all its own and possessed better camouflage. Few churchmen could stand up to the likes of a Newton, a Bradley, a Pierioni, or the dozens of other telescope-watching or equation-writing scientists in white lab coats who convinced the world that they held the only accurate eyes and perceptible ears, along with the impeccable interpretations to verify them. Gregory XVI was apparently deceived by those who were waving the liberalism carrot in one hand while coming by stealth with the scientific wolf in the other.

Whatever the official level of his quiet move, Gregory XVI became the watershed for the Catholic Church's capitulation to the status quo of modern science. Gregory had a simple choice: either he could accept the God of his forefathers or accept the gods of modern science. He chose the latter. It is no surprise, then, that during his stint as Consultor and Pope between 1820 and 1846, all hell broke loose on the Church in the latter half of the 1800s and leading into the 1900s. Both Liberalism and Scientism became stronger and stronger while chapter after chapter of

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[762] "que le pontificat de Grégoire XVI (1830-1846) sera profondément marqué par une opposition aux mouvements libéraux qui naissent alors dans toute l'Europe à la suite de la revolution de juillet 1830 en France, et que nous n'avons aucun témoignage direct d'une ouverture de sa part à 'une saine mais modern phiosophie'..."

Genesis became weaker and weaker. Things would never be the same after Gregory's fateful decision.

Gregory XVI's little quip to Settele in 1833: "…to turn the head or turn the earth? …but, let me turn the earth so that they cannot turn their head…"[763] probably seemed so wise at the time. It shows that he knew exactly what he was doing. He was going to start the Earth turning whereas 1835 years prior, under the vigilance of the tradition before him, the Church kept the Earth still. Gregory apparently thought he was going to set everyone straight because, like his cohort Olivieri, he believed he had the inside scoop on scientific truth that the Church before him didn't possess. In his quip, perhaps the "head" is himself, the head of the Church. Should he turn his head away from what everyone saw as "the clear proofs of science" that the Earth was turning? No, he was far too convinced a Newtonian to let that happen. Instead, he would turn the Earth so that no one could turn "their head," that is, their head the pope, back to the medieval age.

Or perhaps "head" refers to the men of the world who had turned their heads to see what the pope would do. The world had been pointing the finger at the Church for many years, telling her how backward she was for not accepting the latest "opinion of modern astronomers." In this case, the pope decided to turn the Earth so that the men of the world could no longer turn their head in derision toward him. Either way, the pope capitulated on the flimsy evidence that Scientism showed him, just as Adam and Eve capitulated on the hope contained in a piece of fruit. That Newton's apple and Satan's apple accomplished the same task of exposing the faithlessness of God's chosen may be no coincidence.

As we have noted, the huffing and puffing of science against the Church in the days of Gregory XVI is not unlike the nursery rhyme of the Big Bad Wolf. If only the Church had kept its house of brick instead of trading it in for a house of straw. The boastings of Newton and Bradley have been shown to be mere wind. Although in Gregory XVI's reign it was firmly believed that a variety of celestial phenomena proved the Earth was revolving around the sun, they have all been discredited, and it was done so simply and elegantly. To put this in layman's terms, we quote from a popular book on modern cosmology:

> Schoolchildren learn that we live on a planet that revolves on its axis and orbits the Sun, that Nicolaus Copernicus introduced this

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[763] Brandmüller and Greipl, p. 129. Italian: "Cappellari, l'esperto di un tempo e ora papa Gregorio XVI, poteva per esempio chiedere sorridendo al professor Settele in occasione di una udienza nel 1833: …gira la testa o gira la terra? ….ma lasciate che giri la terra, basta, che non girino le teste."

> controversial idea in the sixteenth century, and that some men were persecuted for believing it. But in the end…"all settled"…case closed….Yet our own contemporary science backs away and tells us that when it comes to proving what moves and what doesn't, and whether or not there is an unmoving "center," no one can make an airtight case that any answer is right or wrong. Pick what you will, the Moon, Mars, the Sun, the Earth, your great aunt's dining table – the options are infinite – and it's possible to come up with that as the unmoving center. In fact you are being parochial if you limit the exercise to our planetary system. It is possible to describe the entire universe using any chosen point as the unmoving center – the Earth will do very well – and no one can prove that choice is wrong….Scientists today [merely] prefer to picture everything in motion and nothing as being the center….[but] no one can prove that the Earth moves.[764]

As the scientific philosopher Paul Feyerabend puts it:

> …Galileo's utterances are indeed arguments in appearance only. For Galileo uses propaganda. He uses psychological tricks….This is the essence of Galileo's trickery! As a result, the clash between Copernicus and…ourselves…dissolves into thin air, and we finally realize "that all terrestrial events from which it is ordinarily held that the earth stands still and the sun and the fixed stars are moving would necessarily appear just the same to us if the earth moved and the other stood still."[765]

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[764] Kitty Ferguson, *Measuring the Universe*, pp. 34-35. Even as late as 1941, the president of the Pontifical Academy of Sciences, Agostino Gemelli, gave a speech to the members stating: "…although Galileo did not provide a decisive demonstration of Copernicanism, neither did Newton, Bradley, or Foucault" (cited by Finocchiaro in *Retrying Galileo*, p. 278).

[765] Paul Feyerabend, *Against Method*, pp. 65, 68, the quote coming from Galileo's *Dialogo*, p. 416. Later Feyerabend adds: "And [you] will perhaps see the merits of a different view which asserts that, while the pre-Copernican [Ptolemaic] astronomy was in trouble (was confronted by a series of refuting instances and implausibilities), the Copernican theory was in even greater trouble (was confronted by even more drastic refuting instances and implausibilities); but that being in harmony with still further inadequate theories it gained strength, and was retained, the refutations being made ineffective by *ad hoc* hypotheses and clever techniques of persuasion. This would seem to be a much more adequate description of the developments at the time of Galileo than is offered by almost all alternative accounts" (*Against Method*, p. 105).

Of course, since science was never the main basis for the Church's condemnation of Galileo's claims, those who ramrodded the removal of the condemnation couldn't help but make science the main issue so as to make the Church of the 1600s look inept and ignorant to broach such issues, much less decide them. Regarding Olivieri's comment (*e.g.*, that Galileo could not explain how air could be held to the Earth by gravity, or did not include elliptical orbits of the planets, or that they understood the sun to be motionless), is one of the most malicious distortions of the historical record ever perpetrated by a Catholic cleric. In no instance of the over 7000 documents of the Galileo affair from the seventeenth century is there any mention of such criteria for the reason Copernicus or Galileo were condemned. There existed only one issue at the trial of Galileo, namely, Galileo's insistence that the Earth revolved around the sun. The magaisterium answered this in two parts. It condemned the assertion that the sun did not revolve around the Earth as "formally heretical," and it condemned the assertion that the Earth was not motionless in space as "erroneous in faith." It would have made no difference if Galileo had believed the Earth moved in an ellipse or a circle, or whether he could explain why Earth's air and water were not disturbed by rotation or translation. Any motion of the Earth was condemned because the Congregation of the Index declared, of the two bodies, the sun moved and the Earth did not. Hence, Olivieri's deliberate and desperate attempt to confuse the issue by inserting the red herrings of elliptical orbits and a "devastating mobility" is one of the most deceptive pieces of propaganda ever foisted on the Catholic Church.

The Trail versus the Index

There is another egregious fault on the part of Gregory XVI. Earlier we learned of the incident that occurred in 1765 when French astronomer Joseph Lalande sought to have Galileo's name removed from the *Index*. He was told by the head of the Congregation of the *Index* that no such removal was possible until the sentence given to Galileo at the trial of 1633 was formally and officially rescinded.[766] The importance of this canonical protocol cannot be underestimated. If there is no legal exoneration of Galileo, then, according to canon law, Galileo and his heliocentric theory remain condemned to this very day, and thus, the removal of Galileo's name from the 1835 Index was both illegal and inconsequential.[767] Since the Church, to this very day, has not initiated any official, formal, or legal rescission of either the condemnation against heliocentrism or against Galileo, both remain in force, regardless of whether his name was taken off the 1835 *Index*. An *Index* can revise an *Index*, but an *Index* cannot reverse or revise the results of a canonical trial. The only thing accomplished by removing Galileo's name from the *Index* while keeping the results of his trial in force is the creation of a glaring contradiction in the ecclesiastical record.

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[766] As stated verbatim by Finocchiaro in *Retrying Galileo*, p. 154, with citation to Lalande's 1764 work, *Astronomie*, second edition, vol. 1, pp. 536-41, ¶¶ 1103-4. Also cited in Karl Gebler's *Galileo and the Roman Curia*, 1879, p. 313, and Walter Brandmüller's *Galilei e la Chiesa, ossia il diritto di errare*, 1992, p. 162.

In the end, since the 1616 and 1633 decrees and trial both condemned the heliocentric theory as "formally heretical" and Galileo as being "vehemently suspect" of that formal heresy, it is not only Galileo who was condemned, but the heliocentric theory itself, and it remains in force until legally abrogated by the Church. We can now understand why John Paul II's reinvestigation into the Galileo affair did not seek to overturn the decision of Galileo's trial or even rehabilitate Galileo, but, as Cardinal Casaroli said, to "rethink" what happened. Legally speaking, everything remains as it was in 1633.[768] As the Vatican Secretary of State said by orders of John Paul II to the Galileo commission on July 3, 1981:

> The aim of the various groups should be to rethink the whole Galileo question, with complete fidelity to historically documented facts and in conformity to the doctrine and culture of the time, and to recognize honestly, in the spirit of the Second Vatican Council and of the quoted speech of John Paul II, rights and wrongs from whatever side they come. This is not to be the review of a trial or a rehabilitation, but a serene and objectively

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[767] Mayaud, believing that heliocentrism is correct, takes a different view, stating. "The complete removal in 1835 which was the only logical achievement of that in 1757, has a totally different significance, and it had to be done, because it explained expressly, that the decree of 1616, which had led to those of 1619 and 1634, was definitely revoked and annulled. The Church acknowledged therefore, that she had thus committed an error and by it she rehabilitated already those whom she had condemned." (*The Condemnation of Copernican Books and Its Repeal*, Rome 1997, Introduction, translated from the French).

[768] Recently, Pope Benedict XVI demonstrated the legal power that previous canonical decisions possess when he said this about the 1962 missal for the Mass: "As for the use of the 1962 missal as a forma extraordinaria of the liturgy of the Mass, I would like to draw attention to the fact that this missal was never juridically abrogated and, consequently, in principle, was always permitted. Article 1: …It is, therefore, permissible to celebrate the Sacrifice of the Mass following the typical edition of the Roman Missal promulgated by Bl. John XXIII in 1962 and never abrogated, as an extraordinary form of the Liturgy of the Church" (Motu Proprio: *Summorum pontificum*, July 7, 2007).

founded reflection, in the context of today's historical-cultural epoch.[769]

1850: The Vatican Supports the 1633 Condemnation of Galileo

In 1850, Marino Marini, Prefect of the Vatican Secret Archives, was commissioned by the Vatican to write an updated apologetic work on the Galileo affair. The book's title was *Galileo e l'Inquisizione* ("Galileo and the Inquisition") and was published by the press of the Sacred Congregation for the Propagation of the Faith in Rome. Marini's purpose was to demonstrate that the Catholic Church had saved Europe from heresy and that the Inquisition's punishment of Galileo, which most assuredly did not include torture, was mild compared to what Protestant churches and state courts were known to do against rebels. Marini concludes that the Inquisition handled the trial of Galileo in "justice, wisdom and moderation," and that "we must affirm that perhaps there has never been a judicial action as just and as wise as this one."[770] Marini paid special attention to the meetings that the Tuscan ambassador, Francesco Niccolini, had with Pope Urban VIII in 1632, in which the pope stressed the importance of silencing Galileo, and which papal resolve was reported to Duke Cosimo II, and from which Urban VIII implored Cosimo's help in curtailing Galileo's cosmological heresies.

1893: Pope Leo XIII's Encyclical *Providentissimus Deus*

The encyclical of Pope Leo XIII, *Providentissimus Deus* ("The Providence of God"), contains a polite gesture toward the claims of science, yet without any official or formal concession to its specific propositions. The encyclical is subtitled: "On the Study of Sacred Scripture." Here Pope Leo reiterated the principles of Catholic hermeneutics that had been in practice for more than a millennia and a half, yet he did not mention anything about Galileo or any other related issue concerning the cosmological controversies of the 16th and 17th centuries. In fact, although

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[769] Quoted from Cardinal Casaroli, as translated by M. Segre in "Light on the Galileo Case?" in *Isis* 88, pp. 500-501, as cited in *Retrying Galileo,* p. 344.

[770] *Galileo e l'Inquisizione*, p. 141, as cited in *Retrying Galileo*, p. 230.

Leo XIII's encyclical is often cited to support the heliocentric position, *Providentissimus Deus* is actually one of the Church's strongest statements on the literal interpretation of Scripture and the cautions that need to be exercised against the claims of modern science.[771] We will quote and analyze these portions of his encyclical below. The more significant statements have been underlined for emphasis:

> 17. ….There has arisen, to the great detriment of religion, an inept method, dignified by the name of the "higher criticism," which pretends to judge of the origin, integrity and authority of each Book from internal indications alone. It is clear, on the other hand, that in historical questions, such as the origin and the handing down of writings, the witness of history is of primary importance, and that historical investigation should be made with the utmost care; and that in this matter internal evidence is seldom of great value, except as confirmation. To look upon it in any other light will be to open the door to many evil consequences. It will make the enemies of religion much more bold and confident in attacking and mangling the Sacred Books; and this vaunted "higher criticism" will resolve itself into the reflection of the bias and the prejudice of the critics. It will not throw on the Scripture the light which is sought, or prove of any advantage to doctrine; it will only give rise to disagreement and dissension, those sure notes of error, which the critics in question so plentifully exhibit in their own persons; and seeing that most of them are tainted with false philosophy and rationalism, it must lead to the elimination from the sacred writings of all prophecy and miracle, and of everything else that is outside the natural order.
>
> 18. In the second place, we have to contend against those who, making an evil use of physical science, minutely scrutinize the Sacred Book in order to detect the writers in a mistake, and to take occasion to vilify its contents. Attacks of this kind, bearing as they do on matters of sensible experience, are peculiarly

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[771] As even Fantoli admits: "…in his encyclical *Providentissimus Deus*, Leo XIII dealt with the problem of the relationship between sacred scripture and science….A reference, at least, to the Galilean problem…would have been more than proper. Instead the pope limited himself to an allusion, formulated in extremely cautious terms, to errors committed by individual Church Fathers and, in following epochs, by their interpreters" (*The Case of Galileo: A Closed Question*? 2012, p. 228).

> dangerous to the masses, and also to the young who are beginning their literary studies; for the young, if they lose their reverence for the Holy Scripture on one or more points, are easily led to give up believing in it altogether. It need not be pointed out how the nature of science, just as it is so admirably adapted to show forth the glory of the Great Creator, provided it be taught as it should be, so if it be perversely imparted to the youthful intelligence, it may prove most fatal in destroying the principles of true philosophy and in the corruption of morality. Hence to the Professor of Sacred Scripture a knowledge of natural science will be of very great assistance in detecting such attacks on the Sacred Books, and in refuting them. There can never, indeed, be any real discrepancy between the theologian and the physicist, as long as each confines himself within his own lines, and both are careful, as St. Augustine warns us, "not to make rash assertions, or to assert what is not known as known." If dissension should arise between them, here is the rule also laid down by St. Augustine, for the theologian: "Whatever they can really demonstrate to be true of physical nature, we must show to be capable of reconciliation with our Scriptures; and whatever they assert in their treatises which is contrary to these Scriptures of ours, that is to Catholic faith, we must either prove it as well as we can to be entirely false, or at all events we must, without the smallest hesitation, believe it to be so."

Analysis: In the next few sentences, Leo XIII speaks about the language of Scripture. This is the section to which those advocating a heliocentric model of the universe often appeal, but we will see that the pope says nothing about cosmology or the application of his hermeneutical principles to the specific question of how we are to understand the revolutions of the celestial bodies. As we noted earlier in our rebuttal of Galileo's claim for figurative interpretation, such instances are naturally applied to the anthropomorphic passages in Scripture (*i.e.*, those that give human body parts to God), or to various figures of speech that are commonly used in all cultures, both ancient and modern. The pope states:

> To understand how just is the rule here formulated we must remember, first, that the sacred writers, or to speak more accurately, the Holy Ghost "Who spoke by them, did not intend to teach men these things (that is to say, the essential nature of the things of the visible universe), things in no way profitable unto salvation." Hence they did not seek to penetrate the secrets of nature, but rather described and dealt with things in more or

> less figurative language, or in terms which were commonly used at the time and which in many instances are in daily use at this day, even by the most eminent men of science. Ordinary speech primarily and properly describes what comes under the senses; and somewhat in the same way the sacred writers – as the Angelic Doctor also reminds us – "went by what sensibly appeared," or put down what God, speaking to men, signified, in the way men could understand and were accustomed to.
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> 19. The unshrinking defense of the Holy Scripture, however, does not require that we should equally uphold all the opinions which each of the Fathers or the more recent interpreters have put forth in explaining it; for it may be that, in commenting on passages where physical matters occur, they have sometimes expressed the ideas of their own times, and thus made statements which in these days have been abandoned as incorrect. Hence, in their interpretations, we must carefully note what they lay down as belonging to faith, or as intimately connected with faith – what they are unanimous in. For "in those things which do not come under the obligation of faith, the Saints were at liberty to hold divergent opinions, just as we ourselves are," according to the saying of St. Thomas. And in another place he says most admirably: "When philosophers are agreed upon a point, and it is not contrary to our faith, it is safer, in my opinion, neither to lay down such a point as a dogma of faith, even though it is perhaps so presented by the philosophers, nor to reject it as against faith, lest we thus give to the wise of this world an occasion of despising our faith." The Catholic interpreter, although he should show that those facts of natural science which investigators affirm to be now quite certain are not contrary to the Scripture rightly explained, must nevertheless always bear in mind, that much which has been held and proved as certain has afterwards been called in question and rejected. And if writers on physics travel outside the boundaries of their own branch, and carry their erroneous teaching into the domain of philosophy, let them be handed over to philosophers for refutation.

Analysis: Although it is said that the Fathers sometimes expressed things in the ideas of their own times, Leo XIII does not give any specific examples, and thus there is no direct support for interpreting Earth-sun passages in a non-literal fashion. In fact, it goes without saying that the Fathers would speak from their own culture and use their idiomatic vocabulary since none of them would have known the culture or the idioms of the future. In addition, Leo's remarks about "things belonging to the faith…what they are unanimous in," would technically discount the heliocentric/geocentric debate from the discussion. First, we noted earlier, Cardinal Bellarmine argued that the Earth's centrality and immobility were a "matter of faith," if not so much in the explicit sense, then simply because of the fact that God is the author of Scripture, as even Leo states later in this encyclical (*e.g.*, ¶21: "and that God, speaking by the sacred writers, could not set down anything but what was true"). Second, it is a fact that the Fathers were unanimous in their belief in geocentrism. There was not one dissenting voice. It is perhaps the strongest unanimity the Fathers ever held on a particular topic. Hence, on both counts, faith and patristic unanimity, history shows that geocentrism is not to be included in Leo XIII's category of things to be "figuratively" interpreted or things that the Fathers expressed only "in the ideas of their times."

Also significant in the above paragraph is Leo XIII's comment about the mistakes in science and the overturning of scientific ideas, especially that of physics. He states:

> The Catholic interpreter… must nevertheless always bear in mind, that much which has been held and proved as certain has afterwards been called in question and rejected. And if writers on physics travel outside the boundaries of their own branch, and carry their erroneous teaching into the domain of philosophy, let them be handed over to philosophers for refutation.

This statement has, more or less, been the clarion call of our book, *Galileo Was Wrong: The Church Was Right*. If there is anything of which Catholic theologians and scientists should avail themselves, it is the scientific evidence showing that heliocentrism is at best an unproven theory. These same theologians and scientists should avail themselves to an honest study into the history of science, which starkly reveals that almost every scientific theory proposed as true has been replaced by another theory that falsifies it; and that theory awaits to be replaced by yet another. In light of the new scientific evidence available, we can easily see that heliocentrism is one of those canons of physics that "has been held and proved as certain has afterwards been called in question and rejected."

In the next paragraphs, Leo XIII makes some of the Church's strongest statements upholding the full plenary inerrancy and inspiration of Holy Writ ever recorded. The words of Robert Bellarmine to Galileo meet their strongest echo in the solemn declarations of Leo XIII:

> 20. The principles here laid down will apply to cognate sciences, and especially to History. It is a lamentable fact that there are

many who with great labor carry out and publish investigations on the monuments of antiquity, the manners and institutions of nations and other illustrative subjects, and whose chief purpose in all this is too often to find mistakes in the sacred writings and so to shake and weaken their authority. Some of these writers display not only extreme hostility, but the greatest unfairness; in their eyes a profane book or ancient document is accepted without hesitation, whilst the Scripture, if they only find in it a suspicion of error, is set down with the slightest possible discussion as quite untrustworthy. It is true, no doubt, that copyists have made mistakes in the text of the Bible; this question, when it arises, should be carefully considered on its merits, and the fact not too easily admitted, but only in those passages where the proof is clear. It may also happen that the sense of a passage remains ambiguous, and in this case good hermeneutical methods will greatly assist in clearing up the obscurity. But it is absolutely wrong and forbidden, either to narrow inspiration to certain parts only of Holy Scripture, or to admit that the sacred writer has erred. For the system of those who, in order to rid themselves of these difficulties, do not hesitate to concede that divine inspiration regards the things of faith and morals, and nothing beyond, because (as they wrongly think) in a question of the truth or falsehood of a passage, we should consider not so much what God has said as the reason and purpose which He had in mind in saying it – this system cannot be tolerated. For all the books which the Church receives as sacred and canonical, are written wholly and entirely, with all their parts, at the dictation of the Holy Ghost; and so far is it from being possible that any error can co-exist with inspiration, that inspiration not only is essentially incompatible with error, but excludes and rejects it as absolutely and necessarily as it is impossible that God Himself, the supreme Truth, can utter that which is not true. This is the ancient and unchanging faith of the Church, solemnly defined in the Councils of Florence and of Trent, and finally confirmed and more expressly formulated by the Council of the Vatican. These are the words of the last: "The Books of the Old and New Testament, whole and entire, with all their parts, as enumerated in the decree of the same Council (Trent) and in the ancient Latin Vulgate, are to be received as sacred and canonical. And the Church holds them as sacred and canonical, not because, having been composed by human industry, they were afterwards approved by her authority; nor only because they contain revelation without error; but because, having been written under the inspiration of the Holy Ghost, they have God for their author." Hence, because the Holy Ghost employed men as His instruments, we cannot therefore say that it was these inspired instruments who, perchance, have fallen into error, and not the primary author. For, by supernatural power, He so moved and impelled them to write – He was so present to them – that the things which He ordered, and those only, they, first, rightly understood, then willed faithfully to write down, and finally expressed in apt words and with infallible truth. Otherwise, it could not be said that He was the Author of the entire Scripture. Such has always been the persuasion of the Fathers. "Therefore," says St. Augustine, "since they wrote the things which He showed and uttered to them, it cannot be pretended that He is not the writer; for His members executed what their Head dictated." And St. Gregory the Great thus pronounces: "Most superfluous it is to inquire who wrote these things – we loyally believe the Holy Ghost to be the Author of the book. He wrote it Who dictated it for writing; He wrote it Who inspired its execution."

21. It follows that those who maintain that an error is possible in any genuine passage of the sacred writings, either pervert the Catholic notion of inspiration, or make God the author of such error. And so emphatically were all the Fathers and Doctors agreed that the divine writings, as left by the hagiographers, are free from all error, that they labored earnestly, with no less skill than reverence, to reconcile with each other those numerous passages which seem at variance – the very passages which in great measure have been taken up by the "higher criticism;" for they were unanimous in laying it down, that those writings, in their entirety and in all their parts were equally from the afflatus of Almighty God, and that God, speaking by the sacred writers, could not set down anything but what was true. The words of St. Augustine to St. Jerome may sum up what they taught: "On my part I confess to your charity that it is only to those Books of Scripture which are now called canonical that I have learned to pay such honor and reverence as to believe most firmly that none of their writers has fallen into any error. And if in these Books I meet anything which seems contrary to truth, I shall not hesitate to conclude either that the text is faulty, or that the translator has not expressed the meaning of the passage, or that I myself do not understand."

> 22. But to undertake fully and perfectly, and with all the weapons of the best science, the defense of the Holy Bible is far more than can be looked for from the exertions of commentators and theologians alone. It is an enterprise in which we have a right to expect the co-operation of all those Catholics who have acquired reputation in any branch of learning whatever. As in the past, so at the present time, the Church is never without the graceful support of her accomplished children; may their services to the Faith grow and increase! For there is nothing which We believe to be more needful than that truth should find defenders more powerful and more numerous than the enemies it has to face; nor is there anything which is better calculated to impress the masses with respect for truth than to see it boldly proclaimed by learned and distinguished men. Moreover, the bitter tongues of objectors will be silenced, or at least they will not dare to insist so shamelessly that faith is the enemy of science, when they see that scientific men of eminence in their profession show towards faith the most marked honor and respect. Seeing, then, that those can do so much for the advantage of religion on whom the goodness of Almighty God has bestowed, together with the grace of the faith, great natural talent, let such men, in this bitter conflict of which the Holy Scripture is the object, select each of them the branch of study most suitable to his circumstances, and endeavor to excel therein, and thus be prepared to repulse with credit and distinction the assaults on the Word of God.

1921: Pope Benedict XV's Encyclical: *In Praeclara Summorum*

On April 30, 1921, Pope Benedict XV promulgated the encyclical titled: *In Praeclara Summorum*, commemorating the memory of the poet Dante (1265-1321). In it the pope makes mention of the various antiquated ideas held by Dante and his contemporaries, but through it all Dante was a faithful son of the Church and believed in the basic idea that God created the world and governs it. In the midst of this memorial, the pope says that the Earth "may not be the center of the universe." He writes:

> …It is thus that, according to the Divine Revelation, in this poem shines out the majesty of God One and Three, the Redemption of the human race operated by the Word of God made Man, the supreme loving-kindness and charity of Mary, Virgin and Mother, Queen of Heaven, and lastly the glory on high of Angels, Saints and men; then the terrible contrast to this, the pains of the impious in Hell; then the middle world, so to speak, between Heaven and Hell, Purgatory, the Ladder of souls destined after expiation to supreme beatitude. It is indeed marvelous how he was able to weave into all three poems these three dogmas with truly wrought design. If the progress of science showed later that that conception of the world rested on no sure foundation, that the spheres imagined by our ancestors did not exist, that nature, the number and course of the planets and stars, are not indeed as they were then thought to be, still the fundamental principle remained that the universe, whatever be the order that sustains it in its parts, is the work of the creating and preserving sign of Omnipotent God, who moves and governs all, and whose glory *risplende in una parte piu e meno altrove*; and though this earth on which we live may not be the center of the universe as at one time was thought, it was the scene of the original happiness of our first ancestors, witness of their unhappy fall, as too of the Redemption of mankind through the Passion and Death of Jesus Christ. Therefore the divine poet depicted the triple life of souls as he imagined it in a such way as to illuminate with the light of the true doctrine of the faith the condemnation of the impious, the purgation of the good spirits and the eternal happiness of the blessed before the final judgment.

Little if anything can be extracted from this encyclical for the cause of heliocentrism, however. First, the encyclical is not purporting to be a treatise on either cosmology or cosmogony, and it is the understanding of the Church that no dogmatic teachings are to be gleaned from an ecclesiastical document unless said document specifically addresses and defines the issue at hand. In this case, the encyclical is merely an exoneration of Dante and his works, not a teaching on whether the Earth is the center of the universe. Popes may often gather popular sentiments or ideas from the surrounding culture in order to enhance the basic message they wish to teach, but they have no dogmatic standing whatsoever.

Second, the pope himself is aware of the conditional and speculative nature of his reference to cosmology since he carefully couches his appeal with the subjective word "may" in the sentence: "and though this earth on which we live *may* not be the center of the universe as at one time was thought." To say that the Earth *may not* be the center is as equally indicative as saying that it *may* be the center. In actuality, the fact that the pope did not confirm the scientific consensus, which by this time (1921) firmly believed in heliocentrism, means that he was not allowing himself to be pressured by the scientific community into adopting a non-central Earth as an indisputable fact. Although the pope may have known about the decrees of 1616 through 1664, he was probably under the impression, as many are today, that those decrees had been relaxed somewhat in 1822 and 1835 (yet it is safe to say that he was not aware of the subterfuge behind those two latter events that we have documented above). Since he put no particular study into the question, it is only reasonable that he might have a hesitancy regarding the Church's official position on the matter. This is to be expected since it is common for most Catholics to have inadvertently but speciously relied on the 1822 and 1835 decisions to exonerate heliocentrism to a status of scientific fact that it should not have.

Technically speaking, discussions regarding whether the Earth is the center of the universe must take into account the difference between the geometric center and the center of mass. In the Aristotelian model from which Dante is working, little was known about the center of mass. Barring Ptolemy's use of the equant and deferent, which, giving the illusion of an off-center pivot point which, in turn, affected the speed of the revolving body in relation to the Earth, the Aristotelian universe comprehended the Earth as it would the center of a circle. Modern physics understands the center in two ways, however: one as the center of a circle, the other as the central point of all the mass in the system. The center of mass is what causes a tennis racket to wobble if it is thrown into the air. The reason for this erratic gyration is that the center of mass for the tennis racket is not in the geometric center but more toward the heavier end of the racket. All the mass of the racket will rotate proportionately around the center of mass, not the geometric center, regardless of how the racket is shaped. In the same way, the Earth may be the center of mass of the universe but not the geometric center. Hence Benedict XV's reference to the Earth perhaps not being "the center of the universe" could possibly be true from the geometric perspective employed by Aristotle, Ptolemy, and even Tycho Brahe, but not true from a center of mass perspective. If that is the case, Benedict's statement makes perfect sense, even in its conditional form.

Lastly, we cannot leave the teachings of Benedict XV without remarking on his warning regarding the interpretation of Scripture. Whereas Galileo and his followers were wont to interject a figurative interpretation on any scriptural passage that did not fit their scientific views, Benedict XV decried such a methodology. He writes:

By the doctrine of Jerome those statements are well confirmed and illustrated by which Our predecessor, Leo XIII, solemnly declared the ancient and constant faith of the Church in the absolute immunity of Scriptures from any errors… And, introducing the definitions of the Councils of Florence and Trent, confirmed in the Vatican Synod, he has the following: "Therefore, nothing at all matters... otherwise He Himself were not the Author of all Sacred Scripture."

Although these words of Our predecessors leave no place for ambiguity or evasion, We must grieve, Venerable Brothers, that not only were there not lacking some among those outside the Church, but even among the sons of the Catholic Church, moreover – which wounds Our soul more severely – among the clergy itself and the teachers of the sacred disciplines, who relying proudly on their own judgment, either openly reject the magisterium of the Church on this subject or secretly oppose it. Indeed, We approve the plan of those who, to extricate themselves and others from the difficulties of the Sacred Codex, in order to eliminate these difficulties, rely on all the aids of scholarship and literary criticism, and investigate new avenues and methods of research; but they will wander pitifully from their purpose, if they disregard the precepts of Our predecessor and pass beyond certain limits and bounds which the Fathers have set [Prov. 22:28]. Yet by these precepts and limits the opinion of the more recent critics is not restrained, who, after introducing a distinction between the primary or religious element of Scripture, and the secondary or profane, wish, indeed, that inspiration itself pertain to all the ideas, rather even to the individual words of the Bible, but that its effects and especially immunity from error and absolute truth be contracted and narrowed down to the primary or religious element. For their belief is that that only which concerns religion is intended and is taught by God in the Scriptures; but that the rest, which pertains to the profane disciplines and serves revealed doctrine as a kind of external cloak of divine truth, is only permitted and is left to the feebleness of the writer. It is not surprising, then, if in physical, historical, and other similar affairs a great many things occur in the Bible, which cannot at all be reconciled with the progress of the fine arts of this age. **There are those who contend that these fabrications of opinions are not in opposition to the prescriptions of Our predecessor, since he declared that the sacred writer in matters of nature speaks**

according to external appearance, surely fallacious. But how rashly, how falsely this is affirmed, is plainly evident from the very words of the Pontiff.

And no less do they dissent from the doctrine of the Church who think that the historical parts of Scriptures depend not on the absolute truth of facts, but only on what they call the relative and harmonious opinion of the multitude; and they do not hesitate to infer this from the very words of Pope Leo, because he said that the principles established regarding the things of nature can be transferred to the historical disciplines. And so they contend that the sacred writers, just as in physical matters they spoke according to what was apparent, so they related events unwittingly, inasmuch as these seemed to be established according to the common opinion of the multitude or the false testimonies of others; and that they did not indicate the sources of their knowledge, and did not make the narrations of others their own. Why shall we refute at length a matter plainly injurious to Our predecessor, and false and full of error? For what is the similarity of the things of nature and history, when the physical are concerned with what "appears to the senses," and so should agree with phenomena; while on the other hand the law of history is chiefly this, that what is written must be in agreement with the things accomplished, according as they were accomplished in fact? If the opinion of these men is once accepted, how will that truth of sacred story stand safe, immune from every falsehood, which Our predecessor declares must be retained in the entire text of its literature? But if he affirms that the same principles that have a place in physics can to advantage be transferred to history and related disciplines, he certainly does not establish this on a universal basis, but is only professing that we use the same methods to refute the fallacies of adversaries as we use to protect the historical faith of Sacred Scripture against their attacks....

Nor is Sacred Scripture lacking other detractors; We recognize those who, if they are restrained within certain limits, so abuse right principles indeed that they cause the foundations of the truth of the Bible to totter, and undermine the Catholic doctrine handed down by the Fathers in common. Among these Fathers Jerome, if he were still alive, would surely hurl the sharpest weapons of his speech, because, neglecting the sense and judgment of the Church, they very smoothly take refuge in

> citations which they call implicit, or in accounts historical in appearance; or, they contend that certain kinds of literature are found in the sacred books, with which the whole and perfect truth of the divine word cannot be reconciled; or, they have such an opinion on the origin of the Bible that its authority collapses and utterly perishes. Now, what must be thought of those who in expounding the Gospels themselves diminish the human faith due them and overturn divine faith? For what our Lord Jesus Christ said, and what He did they are of the opinion did not come down to us entire and unchanged, although they are witnesses of all those who wrote down religiously what they themselves had seen and heard; but that – especially with reference to the fourth Gospel – part came down from the evangelists who themselves planned and added much, and part was brought together from the account of the faithful of another age.
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> Now, Venerable Brethren, with the passing of the fifteenth generation after the death of the greatest Doctor, We have communicated with you not to delay to bring these words to the clergy and your people, that all, under the patronage and leadership of Jerome, may not only retain and guard the Catholic doctrine of the divine inspiration of the Scriptures, but may also cling most zealously to the principles which are prescribed in the Encyclical Letter, "Providentissimus Deus," and in this Our own....[772]

1941: Pio Paschini's Book on Galileo

The next ecclesiastical juncture dealing with the Galileo aftermath, and the last one before the convoking of the Galileo commission under John Paul II, was in 1941. Once again, however, we have evidence of how powerful and far-reaching were the 1616 and 1633 decrees against Galileo. The Pontifical Academy of Science commissioned Pio Paschini, a priest and professor of ecclesiastical history in Rome, to write a biography of Galileo for the third centenary of his death, 1942. After completing the work three years later, Paschini submitted it to the Pontifical Academy of Science but it was rejected by both the Academy and the Holy Office, mainly because it was judged to be too favorable to Galileo. The manuscript sat on the shelves of the Academy for the next twenty-two years until it was given to the Congregation for the Doctrine of the Faith under Paul VI. Paschini had since died, but it was decided that as long as the manuscript was revised it could be published, which it eventually was.

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[772] *Spiritus Paraclitus*, September 15, 1920, Denzinger ¶ 2186-2188.

One interesting statement from Paschini in his letter to Deputy Secretary Montini (who would later be elected Paul VI in 1963) reveals that his opponents at the Vatican were voicing with one accord the same historical facts that the president of the Pontifical Academy of Sciences, Agostino Gemelli, had stated in 1941, namely, "…although Galileo did not provide a decisive demonstration of Copernicanism, neither did Newton, Bradley, or Foucault."[773] Paschini concurred with: "They oppose me with the already superseded difficulty that Galileo had not advanced conclusive proof for his heliocentric system."[774]

1616-1664: Are the Papal Decrees Infallible?

Ultimately, the question of the canonical status of the decrees against heliocentrism rests solely with the magisterium of the Catholic Church, and heretofore she has not made any formal and official declaration that the 1616-1664 decrees were infallible. The closest the Church has come to remarking on the status of the decrees is the comment made by John Paul II in his 1992 speech stating: "Cardinal Poupard has also reminded us that the sentence of 1633 was not irreformable." The reference to "irreformable" is another way of saying that the decrees were not infallible, since doctrines that are infallible, even in the words chosen to declare the doctrine, cannot be reformed at any time by any person. They are sealed until the end of time. If by his repeating of Cardinal Poupard's opinion John Paul II was affirming that the 1633 decrees were, in fact, reformable, then this stands as the most public statement on their status. However, the fact that John Paul II's 1992 address to the Pontifical Academy of Science is not considered a formal declaration of Church doctrine, both the address and what it contains cannot be considered the official or definitive word on the issue.

Still, although it may be canonically proper to say that the 1633 decree against heliocentrism as being "formally heretical" was not technically infallible, it is quite a different matter to claim that the 1633 decree was, in actuality, erroneous, as many Catholics have done who have been influenced by the atheistic sectors of modern science. Fr. William Roberts, one of the leading critics of the Catholic Church's handling of the aftermath of the Galileo affair, has the following words to say about the faulty logic that is often employed by Catholic apologists who seek to exonerate the Church from any inconsistency. He writes:

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[773] The words of Finocchiaro in *Retrying Galileo*, p. 278.

[774] *Retrying Galileo*, p. 322.

When the doctrine of the Immaculate Conception was defined, all the conditions of an *ex cathedra* Act were so abundantly and clearly fulfilled that no Roman Catholic theologian would be permitted to raise doubt on the subject. I do not for a moment pretend that heliocentricism was condemned by any judgment of which the same may be said; neither have I attempted to prove that it was. My contention was a very different one; and I will try to explain and vindicate it.

I have found it laid down by such distinguished representatives of the Ultramontane school as Cardenas, La Croix, Zaccaria, and Bouix, that Congregational decrees, confirmed by the Pope and published by his express order, emanate from the Pontiff in his capacity of Head of the Church, and are *ex cathedra* in such sense as to make it infallibly certain that doctrines so propounded as true, are true.

Moreover, it seemed to me…that this opinion was powerfully supported by certain utterances and Acts of the Holy See itself. Take for instance, the language I quoted in my pamphlet, used by Pius IX in the Brief *Eximiam tuam*, in reference to the original decree prohibiting Günther's works. That decree was a simple edict of the Index, having the usual notice that the Pope had ratified the decision and ordered its publication. Yet the Pope speaks of it as having been approved "by his supreme authority," and remarks that, "sanctioned by our authority and published by our order, it plainly ought to have sufficed that the whole question should be judged finally decided – *penitus dirempta*, and that all who boast of the Catholic profession should clearly and distinctly understand…. that the doctrine contained in Günther's books could not be considered sound (sinceram haberi non posse doctrinam Güntherianis libris contentam)." [Roberts asks]: "How, in the name of common sense, could a decree possibly erroneous have made it clear to all Catholics that the doctrine of the books thereby prohibited could not be sound? And how could such a decree have plainly sufficed to determine the whole question at issue?"[775]

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[775] *The Pontifical Decrees Against the Doctrine of the Earth's Movement and the Ultramontane Defence of Them*, Rev. William W. Roberts, London, Parker and Co., 1885, pp. 4-5.

Roberts then adds many more examples of such instances in recent Catholic history. As his convincing repertoire of incidents closes, no Catholic apologist can remain cavalier about the decrees of 1616-1664. The solemnity of those decrees, Roberts reminds us, even if not technically infallible, are still an open wound on the veracity of the Catholic Church if, indeed, the Catholic apologist believes heliocentrism is a scientific fact and the popes who condemned it were wrong.

A word of caution is due at this point, however. Although Roberts, being an Anglican and an avowed heliocentrist,[776] has as his main purpose for pointing out these ecclesiastical anomalies the undermining of the Catholic Church, that is not our purpose here, of course. Roberts will go on to insist that since there is no real difference between "infallibility" and "not being in error," then the 1616-1664 decrees were, for all intents and purposes, "infallible," and thus the Catholic Church is exposed as a bogus institution for having deemed infallible a cosmological theory (geocentrism) that the world now regards as erroneous. On the one hand, our position, obviously, is that Roberts' view of cosmology is itself erroneous and therefore the Church did not err in condemning heliocentrism. On the other hand, Roberts' analysis of the situation should give pause to faithful Catholics to consider that, even though a particular doctrine may not be couched in the technical formula of infallible language, it is, for all intents and purposes, infallible in the practical sense, since such decrees were understood to be true and abiding statements, binding on the Christian faithful.[777] Papal decrees of this sort, especially when the action is not merely disciplinary but involves the determination on a matter of faith (stipulated in the 1633 decree against heliocentrism as: "that which has already been declared and defined to be contrary of the divine Scripture," or as Bellarmine called it: *ex parte dicentis*), can never be erroneous regarding the very issue it condemned. It is generally safe to posit that God will not permit the pope to use his supreme authority to impose on the mind of the Christian faithful doctrines that are false. Surely we would not want to say that God ignores the pope and allows him to require, under pain of excommunication, the Christian faithful to assent to heretical, erroneous, or rash propositions of the faith, even *ex parte dicentis*, whether we deem those doctrines infallible or merely authoritative.

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[776] As noted on pages 34, 47, 48, 97, 106 of his book.

[777] Roberts argues that well known Catholic canonists, such as Bouix in his book *Tractatus de Curia Romana* (part 3, ch. 7, p. 471), teaches that congregational decrees may be infallible if they are specifically confirmed by the pope. Roberts writes: "On turning to M. Bouix's *Tractatus*…we learn that there are three kinds of Congregational decrees: 1. Those which the pope puts forth in his own name after consulting a Congregation. 2. Those which a Congregation puts forth in its own name with the pope's confirmation, or express order to publish… 3. Those which a Congregation with the pope's sanction puts forth in its own name, but without the pope's confirmation or express order to publish. Decrees of the first and second class, we are told, are certainly *ex cathedra*, and to be received with unqualified assent under pain of mortal sin. According to Zaccaia – a very great authority – even decrees of the last class are not fallible, in the sense that they can ever condemn as erroneous a doctrine which is not so" (*The Pontifical Decrees Against the Doctrine of the Earth's Movement*, p. 60.

Until the Catholic Church and her apologists come to the stark realization that their attempts to save the doctrine of infallibility has inadvertently put them in a position of sullying, perhaps beyond repair, the canonically lesser but still authoritative and binding decrees of the popes, they will continue to be the object of criticism from those outside the Church (like Roberts) who wonder if, indeed, this is the honest and forthright institution established by Jesus Christ that it claims to be. In the mid-1800s a publication from the *Dublin Review* raised this very question in the midst of the debates occurring just prior to Pius IX's 1870 declaration on papal infallibility. The author writes:

> We are inclined, however, to think, that the Pope does give a general test, whereby we may certainly know that some letter, addressed to an individual bishop, is intended as an instruction to the whole Church *ex cathedra*. We speak here with diffidence, as we are not aware of any theologian who has treated the question; but we observe that in the recent Encyclical Pius IX unites all the apostolic letters from which the Syllabus is compiled, under the common category of "having been published by him."[778] If the Pope writes to a bishop for his individual instruction, of course there is no secret in the matter, and the letter becomes universally known; yet its publication takes place by the mere force of circumstances. But if the Pope himself *commands* its publication and promulgation, but this very fact he seems to indicate, that the letter is not intended for the bishop alone, but as a public act affecting the whole Church….
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> We have just seen that the Pope's letter to an individual bishop, is often, in fact, a doctrinal instruction addressed to the whole Church. May it not similarly happen, that what is in form the doctrinal decree of a Congregation, is in fact a doctrinal decree

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[778] "Pluribus in vulgus editis Encyclicis…errors damnavimus."

> promulgated by the Pope as universal teacher? We must maintain that under particular conditions this is the fact.[779]

Along these lines of argumentation, it is a fact that Urban VIII promulgated: (a) the 1633 decision that heliocentrism was "formally heretical" and "erroneous in faith," and (b) Galileo's detailed abjuration admitting to the same, to all the Catholic leaders of Europe. Obviously, this was by no means a private affair. As Dorothy Stimson notes:

> Pope Urban had no intention of concealing Galileo's abjuration and sentence. Instead, he ordered copies of both to be sent to all inquisitors and papal nuncios that they might notify all their clergy and especially all the professors of mathematics and philosophy within their districts…[780]

Finocchiaro confirms this situation:

> In the summer of 1633 all papal nuncios in Europe and all local inquisitors in Italy received from the Roman Inquisition copies of the sentence against Galileo and his abjuration, together with orders to publicize them. Such publicity was unprecedented in the annals of the Inquisition and never repeated. As a result, many manuscript copies of Galileo's sentence and abjuration have survived in European archives. By contrast, no copies of the full text of the Inquisition's sentence against Giordano Bruno survive, even though his crime…and his penalty…were much more serious….From the replies of the nuncios and inquisitors, there is concrete evidence that the sentence circulated in the

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[779] *Dublin Review*, Vol. V. New Series, July—October, MDCCCLXV, Dublin: James Duffy & W. B. Kelly, 1865, pp. 385-386. The author adds a quote from Catholic theologian Zaccaria, stating: "…it is Zaccaria's doctrine, that decrees of a Pontifical Congregation, which are published and promulgated by the Pope's express command, are, in fact, his instructions *ex cathedra* and infallible. This doctrine, it seems to us, has received very great support from Pius IX's language in speaking of Günther's condemnation. 'Which decree' (of the Index), he says, 'sanctioned by our authority, and published by our command, ought plainly to suffice, in order, that the whole question be judged as finally decided (penitùs dirempta); and that all who boast of the Catholic profession should clearly and distinctly understand that complete obedience must be paid to it, and that the doctrine contained in Günther's books may not be considered sound (sinceram haberi non posse)'" (*ibid*., p. 387).

[780] Dorothy Stimson, *The Gradual Acceptance of the Copernican Theory of the Universe*, pp. 67-68.

> manner intended. Letters of reply have survived from the nuncios to Naples, Florence, Venice, Vienna, Paris, Brussels, Cologne, Vilnius, Lucerne and Madrid, and from the inquisitors of Florence, Padua, Bologna, Vicenza, Venice, Ceneda, Brescia, Ferrara, Aquileia, Perugia, Como, Pavia, Siena, Faenza, Milan Crema, Cremona, Reggio Emilia, Mantua, Gubbio, Pisa, Novara, Piacenza, and Tortona. The most common reply was a brief acknowledgment of receipt and a promise that the orders would be carried out. However, in this case the standard response was not sufficient for the Inquisition. It expected to be notified that the orders had in fact been carried out. Those who did not send such a follow-up letter were soon reprimanded and had to write back to Cardinal Barberini to explain the oversight of the delay….The quickest promulgation occurred in university circles.[781]

Finocchiaro adds:

> We know today that such a promulgation of Galileo's condemnation had been decided at the Inquisition meeting of 16 June 1633, presided over by Pope Urban VIII; this was the same meeting at which Galileo's trial was discussed and the pope reached a decision on its conclusion, the verdict, and the penalty. Thus the promulgation was not an afterthought but part of a well-considered plan. In fact, the plan was reaffirmed at the meeting of June 30, when the pope was again presiding over the Inquisition meeting and was a little more explicit about its details. Cardinal [Antonio] Barberini's letter followed immediately thereafter.[782]

The letter from Antonio Barberini (brother to Pope Urban VIII) stated the following:

> The Congregation of the Index had suspended Nicolaus Copernicus's treatise *On the Revolutions of the Heavenly Spheres* because that book maintains that the earth moves, and not the sun, which is the center of the world, an opinion contrary to Sacred Scripture; and several years ago this Sacred Congregation of the Holy Office had prohibited Galileo Galilei of Florence from holding, defending, or teaching in any way

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[781] *Retrying Galileo*, pp. 26-28.
[782] *Ibid.*, p. 27.

> whatever, orally or in writing, the said opinion. Nevertheless, the same Galileo has dared to write a book titled [*Dialogo di*] *Galileo Galilei Linceo*, without revealing the said prohibition, he has extorted the permission to print it and has had it printed; claiming at the beginning, within the body, and at the end of that book to want to treat hypothetically of the said opinion of Copernicus (although he could not treat of it in an manner), he has however treated of it in such a way that he became vehemently suspected of having held such an opinion. Thus, he was tried and detained in this Holy Office, and the sentence of these Most Eminent Lords condemned him to abjure the said opinion, to stay under formal arrest subject to the wishes of their Eminences, and to do other salutary penances. Your Reverence can see all that in the attached copy of the sentence and abjuration; this document is sent to you so that you can transmit it to your vicars and it can be known by them and by all professors of philosophy and of mathematics; for, knowing how the said Galileo has been treated, they can understand the seriousness of the error he committed and avoid it together with the punishment they would receive if they were to fall into it. By way of ending, may God the Lord preserve you.[783]

During this time, there were indications from popular philosophers and scientists that the Church had made its desired impression, which then prompted these academicians to seek some measure of safe haven by questioning the precise level of authority the magisterium's decree held. Immediately after Galileo's 1633 trial, René Descartes, who had already written the draft of a book which included his advocacy for heliocentrism, sent a letter to a friend in Paris, stating:

> ….But I will tell you that recently I made inquiries in Leiden and Amsterdam about whether Galileo's *System of the World* was available…I was told that indeed it had been printed, but that all copies had been simultaneously burned in Rome and he had been condemned to some penalty. This has shocked me so much that I have almost decided to burn all my papers, or at least not to let anyone see them. For I surmise that he, who is Italian and as I understand well liked by the pope, was convicted for no other reason than that he undoubtedly wanted to establish the earth's motion…and I confess that if it [heliocentrism] is false, so are

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[783] *Le Opere di Galileo Galilei*, Antonio Favaro, Vol. 15, p. 169, as translated by Finocchiaro, *Retrying Galileo*, p. 27.

> also all the foundations of my philosophy; it is easily demonstrated from them, and it is so connected with all parts of my treatise that I would not know how to detach it without rendering the rest flawed. However, just as I would not want for anything in the world to produce an essay containing the least word that was disapproved by the Church, so I would rather suppress it than publish it maimed.[784]

In a second letter in February 1634, Descartes reiterates his resolve but wonders whether the decree is a binding article of faith:

> ….I have decided to entirely suppress the treatise I had written and lose almost all my work of four years in order to render full obedience to the Church, insofar as it has prohibited the opinion of the earth's motion. However, because I have not yet seen that either the pope or a Council has ratified this prohibition that was issued by the Congregation of Cardinals in charge of book censorship, I would be very pleased to learn what one thinks about it in France nowadays, and if their authority is sufficient to make it an article of faith.[785]

In a third letter, the same thinking persists. Although Descartes, independently of Galileo, believes he has demonstrated the movement of the Earth, his only recourse is to create a gap between the Sacred Congregation and a dogmatic Council:

> Undoubtedly you know that a short time ago Galileo was reproved by the Inquisitors of the Faith and that his opinion on the earth's motion was condemned as heretical. Now, I will tell you that all things I explain in my treatise, including also this opinion of the earth's motion, depend so much on one another that it is sufficient to know that one of them is false to realize that all the reasons I employ have no force at all; and although I think they are based on demonstrations that are very certain and very evident, nevertheless I would not want for anything in the world to maintain them against the authority of the Church. I know well that one could say that nothing decided by the Inquisitors of Rome is thereby automatically rendered an article

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[784] René Descartes, *Oeuvres*, 1897-1913, eds. C. Adam and P. Tannery, Paris, vol. 1, p 270. Also in Favaro's *Le Opere di Galileo Galilei*, vol. 15, p. 340, as cited by Finocchiaro in *Retrying Galileo*, pp. 43-44.

[785] Descartes, *ibid*., p. 280f, Favaro, *ibid*, vol. 16, p. 56.

> of faith, and that it is necessary that it first be approved by a Council.[786]

Hence, Descartes decides to forge a safe haven by recourse to an anachronistic lacuna between the Sacred Congregation and a hypothetical Council, leaving aside the fact that: (a) the pope was the supreme authority behind the condemnation of Galileo, and (b) that even if there were such a Council, its decision must be approved by the reigning pope, otherwise it is null and void, a situation that has occurred more than once in Catholic history. Since from Pius V in 1616, to Urban VIII in 1633, to Alexander VII in 1664 and beyond, the pontiffs were in one accord on condemning any cosmology that required the Earth to move, no Council that affirmed heliocentrism would have been approved by the pope. The pope would have had the final say on the outcome of a Council just as he had the final say on the outcome of his Sacred Congregation. As Catholic apologist, John Daly, notes:

> …no single act of the Sacred Congregations took place without the fullest authorization of the then reigning popes who, in fact, supervised and directed every step of the entire procedure; moreover the pope is himself the *ex officio* prefect of the Holy Office; so just as all of the Sacred Congregations are in fact no more than the instruments through which the pope governs the Church by delegating certain of his powers, the Holy Office is that which has the least possibility of acting independently of the pope. Moreover it is certain that it was the pope who ordered the sentence of the Holy Office condemning Galileo on the 22nd of June 1633 to be promulgated and circulated throughout the

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[786] Descartes, *ibid.*, p. 284f, Favaro, *ibid*, vol. 16, pp. 88-89. Descartes' "demonstrations" of the earth's movement could not have been much better, since he believed Galileo's "reasons proving the earth's motion are very good; but it seems to me that he does not present them as one must in order to be persuasive" (*Le Opere di Galileo Galilei*, vol. 15, p. 125). As most scientists have admitted, Galileo's proofs for a moving earth were entirely fallacious. Finocchiaro adds: "A few years after the *Discourse*, Descartes even felt comfortable enough to discuss the condemned geokinetic thesis. In 1644, he published in Latin the *Principles of Philosophy*….He devised his own system, which was a modification of the Copernican one….Of course, to comply with the ecclesiastical censures, Descartes wanted to engage merely in a hypothetical discussion and not appear to hold or defend the geokinetic thesis. He thought he could accomplish this aim in two ways. First, Descartes devised a version of the doctrine of the relativity of motion and applied it to the earth's motion in such a way as to be able to say that the earth is both stationary and in motion!" (*Retrying Galileo*, p. 50).

> Church, and in 1664 and 1665 it was unquestionably the pope acting *motu proprio* who promulgated anew the decrees condemning all works in favor of heliocentrism in the two editions of the Alexandrine Index of Forbidden Books.
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> No single detail in any of the official acts of the Holy See…can be construed as showing the slightest hesitation in rejecting heliocentrism as absolutely and unconditionally false owing to its conflict with Divine revelation as contained in the Bible. Nor is there any basis for pretending that the prohibition to defend heliocentrism was limited exclusively to Galileo. Certainly on the 25th of February 1616 he was forbidden in a special way to treat the subject. But on the 5th of March 1616 *all* writings in favor of heliocentrism were condemned, no matter by whom they were written, and the minutes of the proceedings of the Holy Office in 1633 show that the reason why the pope ordered wide circulation to be given to the decree condemning Galileo was in order that it might serve as an indication to others of the position of the Holy See on the subject and thereby prevent other writers from falling into the same aberrations as Galileo himself. And in 1664 and 1665 the prohibition became even more general, if possible, when Pope Alexander VII extended it specifically so as to include not only books but even periodical articles, manuscripts and other writings – whatever could be used to promote heliocentrism.[787]

As we can see, the condemnation of Galileo was no private affair. Every person with authority (nuncios, inquisitors, bishops, priests) and academic influence (professors, mathematicians, scientists) knew of the decree and thus their unmitigated cooperation was demanded. As noted, there had never been such a thorough and systematic dissemination of a decision by a pope and his Sacred Congregation. The magisterium's actions were unprecedented. From this evidence one could argue that such pervasive and regimented procedures were at least reasonably close to the criteria required for a binding and irreformable teaching.

Unfortunately, the question concerning the infallibility of a given doctrine of the Catholic Church has always been a minefield of debate and dissent. Debates over everything from whether the decree was disseminated to the universal church or if an Index qualifies as universal, to whether it was said *in forma specifica*, to whether the decree was directly as opposed to indirectly pronounced, to altering the definitions of "declare and define," to whether the pope can use any medium he wishes as long as he makes clear his intentions, continue to rage today. As good as the doctrine of infallibility is, nevertheless, because of its self-imposed restricted domain as to when it is applicable, it invariably creates a whole new set of problems, one chief problem being how we determine whether a specific Church teaching is infallible. Often the Church does not explicitly and unequivocally state that a given doctrine is infallible. Odd as it may seem, the words "infallible" or "irreformable" are not used in dogmatic proclamations. Even the four criteria for papal infallibility established in the decree of Pius IX in 1870 do not make it foolproof for the cleric or the layman to determine when, precisely, a given papal teaching is infallible, since the doctrine in question, ironically, is never preceded by the explicit words: "This teaching is an infallible and irreformable declaration of the Catholic Church for it fulfills all four criteria of the doctrine of papal infallibility." Adding to the debate, the 1983 Code of Canon Law states that if the Church does not explicitly declare a doctrine infallible, then it is not to be considered infallible.[788] The whole process can easily become a quagmire of distinctions and counter-distinctions that turn that which was at first intended to be a simple help to the difficulties of life into tedious, hair-splitting legalese that often confuses more than it clarifies.

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[787] John S. Daly, "The Theological Status of Heliocentrism," October 1997, unpublished and privately circulated paper, p. 12.

The four criteria for papal infallibility are delineated in prose form in the following paragraph of Vatican I (numerals in brackets are added): "…the Roman Pontiff, when he speaks *ex cathedra*, that is, [1] when carrying out the duty of the pastor and teacher of all Christians [2] in accord with his supreme apostolic authority [3] he explains a doctrine of faith or morals [4] to be held by the universal Church…".[789] As noted, questions of when and where these four criteria are applicable continue to raise problems. For example, the recent teaching against artificial contraception given by Pope Paul VI in 1969 in the encyclical *Humanae Vitae*, and the teaching against women's ordination given by John Paul II in 1994 in the letter *Ordinatio Sacerdotalis*, have raised continued questions whether those two teachings are formally infallible. If they are infallible, the documents themselves do not explicitly say so. Although at least the latter uses language that some may interpret as the formula of words often associated with an infallible declaration, still, there remain doubts due to the fact that the pope who issued them never declared them explicitly infallible (see Code of Canon Law, ¶ 749.3).[790] If they are not formally infallible, then they are technically "reformable," just as Cardinal Poupard said about the decrees against Galileo.

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[788] 1983 Code of Canon Law states: "No doctrine is understood as defined infallibly unless this is manifestly evident" (Canon 749.3). The 1917 Code of Canon Law put it this way: "Nothing is understood to be dogmatically declared or defined unless this shall be manifestly certain" (Canon 1323).

[789] Denz. ¶ 1839.

At this point, advocates for the infallibility of the above documents (*Humanae Vitae* and *Ordinatio Sacerdotalis*) will sometimes retreat from depending on *papal* infallibility and make an appeal to the *inherent* infallibility of the "ordinary magisterium" or the "constant teaching of the Church" as the authoritative basis for declaring these two doctrines infallible. Although legitimate, this appeal, however, has its own set of problems, since it is open to the subjective judgment of clerics or laymen on a much lower level of authority than the pope, and thus, it invariably creates diverse opinions as to which specific traditional Church teachings are infallible and which are not infallible. If it is not infallible, but merely authoritative, many feel that, although they could give "assent" to the teaching, they are not bound to obey it if, for the sake of conscience, they find it morally unacceptable.

At this point, their adversaries will appeal to other papal statements (Pius XII's *Humani Generis*),[791] the Code of Canon Law,[792] or conciliar statements (*e.g.*, Vatican II's *Lumen Gentium 25*) and insist that they are obligated to obey. For example, the latter document states:

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[790] In fact, a few months after the issuance of *Ordinatio Sacerdotalis*, Cardinal Joseph Ratzinger was approached by various bishops questioning whether the document was infallible. Ratzinger affirmed that it *was* infallible. This, however, creates two problems: (1) it shows that the document did not contain explicit and unequivocal language declaring its infallibility, and (2) the affirmation of its infallibility came from the head of the Congregation for the Doctrine of the Faith, not the pope who wrote the document, thus making the affirmation of the document's status dependent on a fallible, although respected, opinion.

[791] *Humani Generis* states: "Nor must it be thought that the things contained in Encyclical Letters do not of themselves require assent on the plea that in them the Pontiffs do not exercise the supreme power of their Magisterium. For these things are taught with the ordinary Magisterium, about which it is also true to say, 'He who hears you, hears me.' [Lk 10. 16]...If the Supreme Pontiffs, in their acts expressly pass judgment on a matter debated until then, it is obvious to all that the matter, according to the mind and will of the same Pontiffs, cannot be considered any longer a question open for discussion among theologians."

[792] Canon 752: "Although not an assent of faith, a religious submission of the intellect and will must be given to a doctrine which the Supreme Pontiff or the college of bishops declares concerning faith or morals when they exercise the authentic magisterium, even if they do not intend to proclaim it by definitive act; therefore, the Christian faithful are to take care to avoid those things which do not agree with it."

> "This loyal submission of the will and intellect must be given, in a special way, to the authentic teaching authority of the Roman Pontiff, even when he does not speak *ex cathedra* in such wise, indeed, that his supreme teaching authority be acknowledged with respect, and sincere assent be given to decisions made by him, conformably with his manifest mind and intention, which is made known principally either by the character of the documents in question, or by the frequency with which a certain doctrine is proposed, or by the manner in which the doctrine is formulated."

But in respect of the Church's geocentric teachings and its corollary condemnations of heliocentrism over the past two thousand years, *Lumen Gentium 25* brings us back to square one, as it were, in authenticating the authority of the 1616-1664 decrees and the level of commitment and obedience Catholics must give to them. In effect, Cardinal Poupard's and John Paul II's appeal to the decrees against heliocentrism as not being "irreformable" becomes moot or superfluous since, as is true with many teachings of the Catholic Church, the mere "ordinary" or "traditional" authority of the decrees plays a larger part, according to *Lumen Gentium 25*, in commanding submission from the Catholic parishioner. In fact, the Church's historic teaching on geocentrism and her condemnation of heliocentrism fulfills all the criteria of *Lumen Gentium 25*:

- "that his supreme teaching authority be acknowledged with respect":

It was certainly the case that popes Paul V, Urban VIII and Alexander VII understood themselves and their decrees against heliocentrism as coming from their "supreme teaching authority" and commanded that it be "acknowledged with respect." Urban VIII, for example, approved his Holy Office's conclusion that heliocentrism was "formally heretical" and "erroneous in faith," and demanded that Galileo sign an abjuration to that effect. Obviously, Pope Urban VIII also considered his predecessor's decree, Paul V's, as authoritative, binding, and demanding respect, since the 1633 decree was based on the condemnations of the 1616 decree.

- "and sincere assent be given to decisions made by him":

It was certainly the case that the decrees against Copernicanism required the "assent" of Galileo, Foscarini, and all the other theologians who were venturing into the area of biblical cosmology. Urban VIII sent letters of the decree against Copernicanism and Galileo's abjuration to all the papal nuncios and universities of Europe showing the seriousness of the issue and his desire to have it widely disseminated so that the Christian faithful would be obedient to it. Alexander VII devoted a signed papal bull to the subject of banning books that threaten the faith and welfare of the Christian faithful, stating: "We command each and every one of our venerable brethren, the patriarchs, archbishops, bishops and other Ordinaries of places, as well as those beloved sons who are their vicars and officials, the inquisitors of heretical depravity, the superiors of every kind of religious Order, congregation, society, or institute, and all others…" to obey his words.

- "conformably with his manifest mind and intention":

Few can read the documents surrounding the Galileo affair and come away without the conviction that the popes, cardinals and the Holy Offices were as resolute in their condemnation of Copernicanism as they have been about most major doctrines of the Church. The popes used and approved very solemn and foreboding language and made sure that the decrees were enforced throughout Europe.

- "which is made known principally either by the character of the documents in question"

The decrees against heliocentrism were put in place for the express purpose of protecting Scripture from false interpretations and protecting the Christian faithful from harmful teachings. Although the decrees may not reach the level of being declared formally infallible, they are, nevertheless, on the same level of "ordinary" or "traditional" authority as most other doctrines that the Church has taught.

- "or by the frequency with which a certain doctrine is proposed"

The formal and official condemnations of Copernicanism spanned a period of fifty years (1615-1665) and were delineated by three different popes. The number of ecclesiastical documents and other personal correspondences written about the Galileo affair over the course of three decades (1615-1633) exceed 7,000. Obviously the Church considered this a grave matter. She incessantly appealed to the 1500 years of tradition on the teaching of geocentrism as her greatest bulwark against the new ideas of Copernicus and Galileo.

- "or by the manner in which the doctrine is formulated":

During the condemnations against heliocentrism the Church issued some of the most detailed and comprehensive decrees ever written. Every wrinkle of the issue was investigated, arguments were presented and rebutted, witnesses were put under oath, experts were called in for testimony, the most severe and condemnatory language was formulated in the final decree, that is, that heliocentrism was "formally heretical" and "erroneous in faith." If geocentric doctrine does not qualify under the rubrics of *Lumen Gentium 25*, what does?

1870: Vatican I, the Ordinary Magisterium, and Modern Science

Vatican I also had some important things to say regarding the authority of the ordinary magisterium and the claims of modern science. They are as follows:

> **Vatican I**: Further, by divine and Catholic faith, all those things must be believed which are contained in the written word of God and in tradition, and those which are proposed by the Church, either in a solemn pronouncement or in her ordinary and universal teaching power, to be believed as divinely revealed.[793]

Analysis: In regard to "those things proposed by the Church," Vatican I makes no distinction between a "solemn pronouncement" (an infallible, *ex cathedra*, definition) and the ordinary magisterium, insofar as it concerns the truth of a doctrine. Both sources are to be considered as "divinely revealed." Hence, if the condemnations of heliocentrism, which were "declared and defined" as being "formally heretical" and "erroneous in faith" were not "solemn pronouncements," it follows that they were then authoritative decisions from the "ordinary magisterium," and are likewise to be understood as "divinely revealed." Vatican I adds:

> **Vatican I**: By enduring agreement the Catholic Church has held and holds that there is a twofold order of knowledge, distinct not only in principle but also in object: (1) in principle, indeed, because we know in one way by natural reason, in another by divine faith; (2) in object, however, because, in addition to things to which natural reason can attain, mysteries hidden in God are

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[793] Denzinger ¶1792.

> proposed to us for belief which, had they not been divinely revealed, could not become known.[794]

Analysis: In this case, the matter of geocentrism, which, on one level, the Church proposed as a "matter of faith," it is a fact that modern science, especially the relativistic forms, admits that it cannot determine whether the Earth moves or is stationary. In effect, the immobility of the Earth is something that can only be revealed by "divine faith."

> **Vatican I**: But, although faith is above reason, nevertheless, between faith and reason no true dissension can ever exist, since the same God, who reveals mysteries and infuses faith, has bestowed on the human soul the light of reason; moreover, God cannot deny Himself, nor ever contradict truth with truth. But, a vain appearance of such a contradiction arises chiefly from this, that either the dogmas of faith have not been understood and interpreted according to the mind of the Church, or deceitful opinions are considered as the determinations of reason. Therefore, "every assertion contrary to the truth illuminated by faith, we define to be altogether false."[795]

Analysis: In regards to the issue of geocentrism, both of the above warnings come into play: (a) Cardinal Bellarmine informed Galileo that geocentrism was a "matter of faith" and that the Church, based on the consensus of the Fathers, could not interpret Scripture in opposition to the same literal interpretation that had been passed down to it through the preceding centuries. In essence, Galileo was accused of not interpreting Scripture "according to the mind of the Church"; (b) since false claims of scientific proof for heliocentrism were consistently being advanced (*e.g*., Foscarini, Galileo, Kepler, Bradley, Settele, Boscovich, Newton, Bessel), and from which many people became convinced that heliocentrism was correct, these would have to be classed as "deceitful opinions [that] are considered as the determinations of reason."

> **Vatican I**: Further, the Church which, together with the apostolic duty of teaching, has received the command to guard the deposit of faith, has also, from divine Providence, the right and duty of proscribing "knowledge falsely so called" [1Tm 6:20], "lest anyone be cheated by philosophy and vain deceit" [Cl 2:8]. Wherefore, all faithful Christians not only are forbidden

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[794] Denzinger ¶1795.

[795] Denzinger ¶1797.

> to defend opinions of this sort, which are known to be contrary to the teaching of faith, especially if they have been condemned by the Church, as the legitimate conclusions of science, but they shall be altogether bound to hold them rather as errors, which present a false appearance of truth.[796]

Analysis: Obviously, Galileo was "forbidden to defend opinions" of "knowledge falsely so called," concerning the claims of science that asserted the Earth revolved around the sun.[797] Galileo was reminded in 1633 that heliocentrism, as early as 1616, had already been "declared and defined as opposed to Scripture," and was now declared to be "formally heretical" and "erroneous in faith" in 1633. Hence, the Church made it known that heliocentrism was, in the language of Vatican I, "known to be contrary to the teaching of faith," since it had clearly "been condemned by the Church," even though it was commonly believed to be a "legitimate conclusion of science." These "legitimate conclusions," the Church warned, could "present a false appearance of truth," which is certainly the case for heliocentrism since geocentrism can be demonstrated to work just as well on a geometric basis. It is quite clear that the ordinary magisterium can, without invoking infallibility, declare these theoretical beliefs of science as propping up a "false appearance," and are thus "formally heretical" and "erroneous." It is clear that this was done in 1616, 1633 and 1664, and these teachings against heliocentrism were never officially and formally rescinded or reformed.

> **Vatican I**: And, not only can faith and reason never be at variance with one another, but they also bring mutual help to each other, since right reasoning demonstrates the basis of faith and, illumined by its light, perfects the knowledge of divine things, while faith frees and protects reason from errors and provides it with manifold knowledge. Wherefore, the Church is so far from objecting to the culture of the human arts and sciences, that it aids and promotes this cultivation in many ways. For, it is not ignorant of, nor does it despise the advantages flowing therefrom into human life; nay, it confesses that, just as they have come forth from "God, the Lord of knowledge" [1 Samuel 2:3], so, if rightly handled, they lead to God by the aid of

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[796] Denzinger ¶1798.

[797] Some Bibles during this precise time in history (1611-1633) translate 1 Timothy 6:20 as "science falsely so called" (KJV), which shows a common understanding in the early 1600s that "science" was often equated with "knowledge."

> His grace. And it (the Church) does not forbid disciplines of this kind, each in its own sphere, to use its own principles and its own method; but, although recognizing this freedom, it continually warns them not to fall into errors by opposition to divine doctrine, nor, having transgressed their own proper limits, to be busy with and to disturb those matters which belong to faith.[798]

Analysis: If, for example, "right reasoning" was employed in 1887 when the Michelson-Morley experiment was preformed, it would have shown that a slight impedance of light's velocity would be due to the rotation of space around a stationary Earth and not because matter shrinked when it moved or that time slowed down. In that case "reason" would have worked very well with "faith." But Einstein, being an atheist, had no faith. He ridiculed Christianity. Therefore, he would consider the rotation of space around a stationary Earth as "unthinkable," and his colleague Edwin Hubble, a like-minded atheist, even though he saw through his telescope evidence that the Earth was in the center of the universe, rejected it as a "horrible" conclusion and something that must be "avoided at all costs." Faith in Scripture could have provided the necessary boundaries for the crucial interpretations of the scientific experiments of the late 1800s and 1900s. Science would have been spared the wild goose chase it was forced to run as it began inventing a world in which twins age at different rates, clocks slow down at will, matter shrinks upon movement, where one is forced to say that up may be down and left may be right in order to have at least some answer to the crucial experiments. As Thomas Aquinas put it:

> The knowledge proper to this science of theology comes through divine revelation and not through natural reason. Therefore, it has no concern to prove the principles of other sciences, but only to judge them. Whatever is found in other sciences contrary to any truth of this science of theology, must be condemned as false.[799]

John Daly adds:

> It is perfectly true that the Church's authority does not extend to the order of natural science and that therefore the Church cannot pronounce on whatever belongs exclusively to that order, or on anything insofar as it belongs to that order. The Church could not

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[798] Denzinger ¶1799.

[799] *Summa Theologica*, I, Ques. 1, Art. 6, ad. 2.

> define the number of chemical elements, canonize the value of *pi* or forbid scientists to attempt to effect cold fusion, but she is entirely free to teach or legislate on any topic coming within her sacred field of competence even if that topic simultaneously belongs to the natural order.[800]

Vatican I concludes:

> For, the doctrine of faith which God revealed has not been handed down as a philosophic invention to the human mind to be perfected, but has been entrusted as a divine deposit to the Spouse of Christ, to be faithfully guarded and infallibly interpreted. Hence, also, that understanding of its sacred dogmas must be perpetually retained, which Holy Mother Church has once declared; and there must never be recession from that meaning under the specious name of a deeper understanding. "Therefore...let the understanding, the knowledge, and wisdom of individuals as of all, of one man as of the whole Church, grow and progress strongly with the passage of the ages and the centuries; but let it be solely in its own genus, namely in the same dogma, with the same sense and the same understanding."[801]

1965: Vatican Council II"s *Gaudium et spes*

As noted earlier, Vatican Council II did not address the Galileo issue directly; rather, it made some general comments about the relationship between science and religion, but with a slight twist. The comments were limited to one paragraph of *Gaudium et spes*, which is miniscule compared to the volume of documents produced at Vatican II, especially in light of the burgeoning claims of science that had been forthcoming for the prior fifty years. Paragraph 36 of *Gaudium et spes* states:

> Now many of our contemporaries seem to fear that a closer bond between human activity and religion will work against the independence of men, of societies, or of the sciences.
>
> If by the autonomy of earthly affairs we mean that created things and societies themselves enjoy their own laws and values which

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[800] John S. Daly, "The Theological Status of Heliocentrism," October 1997, unpublished, privately circulated paper, p. 14.
[801] Denzinger ¶1800.

> must be gradually deciphered, put to use, and regulated by men, then it is entirely right to demand that autonomy. Such is not merely required by modern man, but harmonizes also with the will of the Creator. For by the very circumstance of their having been created, all things are endowed with their own stability, truth, goodness, proper laws and order. Man must respect these as he isolates them by the appropriate methods of the individual sciences or arts. Therefore if methodical investigation within every branch of learning is carried out in a genuinely scientific manner and in accord with moral norms, it never truly conflicts with faith, for earthly matters and the concerns of faith derive from the same God.(6) Indeed whoever labors to penetrate the secrets of reality with a humble and steady mind, even though he is unaware of the fact, is nevertheless being led by the hand of God, who holds all things in existence, and gives them their identity. Consequently, we cannot but deplore certain habits of mind, which are sometimes found too among Christians, which do not sufficiently attend to the rightful independence of science and which, from the arguments and controversies they spark, lead many minds to conclude that faith and science are mutually opposed.(7)
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> But if the expression, the independence of temporal affairs, is taken to mean that created things do not depend on God, and that man can use them without any reference to their Creator, anyone who acknowledges God will see how false such a meaning is. For without the Creator the creature would disappear. For their part, however, all believers of whatever religion always hear His revealing voice in the discourse of creatures. When God is forgotten, however, the creature itself grows unintelligible.

We can see from a fair reading of the two underlined paragraphs that no specific concessions are made to Galileo and no specific endorsements are given to heliocentrism. Although the "rightful independence of science" is acknowledged, this is not an independence that allows science to go outside the boundaries of the faith or say things that contradict the faith. In both of the above paragraphs the message that shines through is that science and faith must work together and must never oppose one another. The reason, of course, is that they have God as both their author and designer.

The resolve of Vatican II not to give any direct concessions to Galileo was made clear when, as Fantoli describes it,

> During the preparatory phase of the document the proposal was put forth for a frank recognition of the errors committed by the Church with respect to Galileo, and it became partially accepted by the "joint commission" which dedicated a new paragraph (No. 40) to the question of the autonomy of culture, where a brief mention was made of the error of the condemnation of Galileo."[802]

This event, of course, never happened, since the proposed paragraph #40 contains no mention of Galileo and no error made by the Church. Monsignor Pietro Parente, co-president of the commission, saw to it that the reference to Galileo was eliminated, stating: "[It is] not appropriate to speak of it in this document – so as not to ask the Church to say: I have been wrong."[803] Whatever Parente's motivations were, even if it were to save face for the Church that he personally thought had erred, is really of no consequence in the final tally, since, as those who understand Catholic protocol know, ecumenical councils are guided by the Holy Spirit. As such, it would have been erroneous to say that the Church made an error in her condemnation of Galileo and heliocentrism. If heliocentrism was correct, this was the perfect opportunity for the Holy Spirit, through the Church, to clear the air, as it were. The fact that it never happened shows once again that the efforts of the three popes of the 17th century to eliminate the "formally heretical" view of heliocentrism from Catholic doctrine still reverberate today, although in much more subtle tones.

The only allusion to the Galileo affair that appeared in the Vatican II discourse is a footnote added to paragraph 36 citing Paschini's work.[804] But even then, as Fantoli admits, the citation of Paschini's work on Galileo

> had been made possible only by means of the changes already mentioned [to Paschini's original 1944 publication], especially those more important and drastic ones which concerned the original judgment of Paschini on the behavior of the Church in 1616 and 1633.[805]

Unfortunately, some of the more liberal sectors of Catholicism have been prone to eisegete these paragraphs from *Gaudium et spes* to reach the agenda-driven conclusion that the Church has given science full reign to propose any theory it desires, and that the Church has little or no say in what is distilled from those theories. In actuality, *Gaudium et spes* not only refuses to acknowledge any error on the part of the Church in the Galileo affair, it says nothing different than what was previously stated in the Church's tradition, for all the Church's authorities, from Bellarmine, the Council of Trent, Pius IX to Leo XIII, taught that faith and science can never conflict. Indeed, that has been the whole theme of our book, *Galileo Was Wrong: The Church Was Right*, since, if studied carefully and without the atheistic agenda common in the sciences today, modern science has demonstrated quite handily that the faith of our fathers who held fast to geocentrism was not in vain.

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[802] Annibale Fantoli, *Galileo: For Copernicanism and for the Church*, p. 505.

[803] *Ibid.*

[804] The *Guadium et spes* footnote at #7 above reads: "See Pio Paschini, Vita e Opere di Galileo Galilei, 2 vol., Pont. Academia Scientiarum, Vatican City State, 1964."

[805] *Galileo: For Copernicanism and for the Church*, p. 506.

2003: Catholic Apologetics & Geocentrism

Obviously, questions concerning the infallibility of the 1616, 1633 and 1664 decrees against heliocentrism invariably surface because society has assumed that heliocentrism is a proven scientific fact, which then leads to the conclusion that the ecclesiastical decrees condemning it were in error. Additionally, since the Church has admitted that it is theoretically possible for her to make errors in her "non-infallible" teachings, Catholics of the past one hundred years have concluded that the proper apologetic concerning the Galileo affair is to communicate to the world that the popes and cardinals of the 17th century, although faithful to their calling as pastors, were, to put it politely, a little overbearing and misdirected in their dedication to Scripture and Catholic tradition. Added to this apologetic is the rationale that such errors are permissible within the confines of Catholic protocol because only when the pope speaks *ex cathedra* and fulfills the four criteria stipulated at Vatican Council I is his teaching infallible.

Society of St. Pius X, *The Angelus*

Such is the tack taken, for example, by one of the more popular Catholic traditionalist magazines, *The Angelus*:

> Firstly, in terms of apologetics, if the Church indeed pronounced solemnly that the earth does not revolve around the sun, then she almost certainly would have erred. Naturally, this situation

> would have eliminated her claim of infallibility, which would in turn destroy her claim of Divine institution.[806]

Later Winschel writes: "And yet, the earth moves!" and "Galileo was right about heliocentrism," and "Galileo seems to have won out both on theological as well as scientific grounds."[807] Here we have the typical child of the Enlightenment; one who has accepted the *status quo* of modern science without reservation and is willing to put it all on the line, as it were, believing that everything can be answered on that basis. The absolute fact he employs to make his conclusions is that science has proven the Earth revolves around the sun; yet, ironically, he provides no such proof in his article. Although it might appear that he gives himself at least some escape clause in the words: "then she *almost certainly would have* erred," he is not so equivocal toward the end of his article:

> Had the Inquisition made a mistake in declaring heliocentrism heretical? Yes. Did the Church err? Absolutely not. In fact, where the Holy Ghost played a role was in seeing to it precisely that the Church did not at this time make the error of stamping the decision of the Holy Office with her infallible approval.[808]

Here we see, perhaps, an additional apologetic. The goal is not merely to protect the doctrine of papal infallibility but to minimize the role of the popes and make it appear as if they had little to do with the whole affair. The same type of evasion was employed in the 1992 papal speech prepared mainly by Cardinal Poupard. It spoke of the "error of the theologians" but laid no blame on the popes and cardinals who, everyone knows, played a much larger role than what the speech admitted. We can understand the dilemma of these apologists. Since they are convinced that a gross "error" occurred in the years 1616 to 1664, there is little choice but to deflect as much blame from off the hierarchy as possible, for image is just as important as substance in such cases. Even though these authors know that the historical record shows quite clearly that over the course of fifty years Paul V, Urban VIII and Alexander VII facilitated, interrogated, presided, endorsed, commanded, demanded abjurations, sent signed notices to papal nuncios, and signed papal bulls endorsing the condemnation of heliocentrism, respectively, the whole burden of the supposed mishap is placed on the shoulders of the "Inquisition," perhaps because that infamous institution has always been the favorite boogeyman employed to epitomize the primitive and uneducated medievals of yesteryear who were just a bit too zealous for their Christian faith and who are thus caricatured as having not the slightest wit about things scientific. The title of the apologist's article could just as well be worded: *The Popes: Victims or Villains?* and probably get his point across much better. As such, it would be his contention that the popes involved in the Galileo affair are not to be considered "villains" who besmirched the Church's reputation by promoting error; rather, they are "victims" of an Inquisition gone awry, a runaway train that the pontiffs were helpless to stop. This is the type of murky quicksand that Catholic apologists are forced to adopt once they elevate the premise of heliocentrism to an established scientific fact. They find themselves inadvertently implying that the Church at large could be: (a) led wholesale down the primrose path of error; (b) be virtually ignored by the Holy Spirit because He apparently doesn't deal in things stated "non-infallibly"; (c) led to maintain a specious allegiance to the consensus of the Church Fathers; (d) led to erroneously uphold the traditional belief in inerrancy and literal interpretation of Scripture, and (e) be forever embarrassed in front of a gapping world of critics, all for the sole purpose of "saving the doctrine of papal infallibility" a doctrine which, ironically, was neither employed nor defined until the late nineteenth century.

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[806] Jason Winschel, "Galileo, Victim or Villain," *The Angelus*, October 2003, p. 10. A few months after the article was published, we approached the editor of *The Angelus* and asked if he would allow us to write a rebuttal for the sake of fairness. He declined, even after an appeal. A milder treatment of the Galileo affair is written by Thomas E. Woods, Jr. in *How the Catholic Church Built Western Civilization* (2005), although Woods gives no consideration to the idea that Galileo could have been wrong. Fr. Victor P. Warkulwiz, in *The Doctrines of Genesis 1-11: A Compendium and Defense of Traditional Catholic Theology on Origins* (2007) is highly favorable to geocentrism.

[807] *Ibid.*, pp. 36, 38.

[808] *Ibid.*, p. 36.

On the other hand, this type of apologetic forces the bearer to speculate in the negative about the motivations of the popes. Toward the end of his article, Winschel, driven by his belief that "Galileo was right about heliocentrism," finally faces the pope and, as we would expect him to do, puts the blame on the pontiff instead of Galileo:

> In Galileo's defense, one could argue that certain Churchman acted disreputably during this affair. Motivated by wounded pride, Pope Urban VIII certainly exaggerated when he referred to the whole thing as the worst scandal in the History of the Church. This in the midst of the Thirty Years' War and hot on the heels of the Protestant Revolution, the Western Schism and the abuses of the Renaissance Era?![809]

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[809] *Ibid.*, p 38.

The first thing Winschel's approach verifies for us is the very reason that our volumes were written as they are – with strong emphasis on the scientific side of the debate. Being a product of his intellectual culture (the Enlightenment, modern science, historical criticism, *etc.*), a whole generation of Catholics have been reared and educated in the school of heliocentric hegemony. One such example is the school of Teilhardianism, the teachings of the wayward Catholic theologian from France, Pierre Teilhard de Chardin, whose corrupting influence began in the early 1900s and found its way into many of the minds of the prelates who sat at Vatican II. Earlier we cited his strange "omega-searching" evolutionary ideas, but Teilhard was also pushing for the connection between the demise of geocentrism and the rise of evolutionary thought, as well as his desire to rid the world of the traditional notion of Original Sin. In the book published in 1969 (fourteen years after his death), *Christianity and Evolution*, he writes:

> It is not only, in fact, a few palaeontological discoveries which are forcing the Church to lose no time in modifying her ideas about the historical evidence of human origins. The whole new physiognomy of the universe, as disclosed to us for some centuries now, is introducing an intrinsic imbalance into the very core of the dogma; and we cannot escape from this except through an extensive metamorphosis of the notion of original sin.

> As a result of the collapse of geocentrism, which she has come to accept, the Church is now caught between her historico-dogmatic representation of the world's origin, on the one hand, and the requirements of one of her most fundamental dogmas on

> the other – so that she cannot retain the former without to some degree sacrificing the latter.
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> In earlier times, until Galileo, there was perfect compatibility between historical representations of the Fall and dogma of universal redemption – and all the more easily, too, in that each was modeled on the other. So long as people believed as St. Paul himself did, in one week of creation and a past of 4000 years – so long as people thought the stars were satellites of the earth, and that animals were there to serve man – there was no difficulty in believing that a single man could have ruined everything, and that another man had saved everything. Today we know, with absolute physical certainty, that the stellar universe is not centered on the earth, and that terrestrial life is not centered on mankind…. With the end of geocentrism, what was emerging was the evolutionist point of view. All that Galileo's judges could distinctly see as menaced was the miracle of Joshua. The fact was that in consequence the seeds of decomposition had been introduced into the whole of the Genesis theory of the fall: and we are only today beginning to appreciate the depth of the changes which at that time were already potentially completed [in Galileo's day].[810]

The "collapse of geocentrism" was leading many Catholics, who were already predisposed to liberal theology and liberal hermeneutics, down the primrose path of accepting evolution as a fact. Another example is George Mivart, a convert to Catholicism in the late 1800s. As Finocchiaro describes it:

> Mivart…argued for the compatibility of Christianity and evolution….that Galileo's trial showed that the Church was fallible in scientific matters, and so modern Catholics had complete freedom in scientific inquiry; but he argued that the Church's error on Copernicanism was a providential one…"[811]

Suffice it to say, there is no proof for Mivart's accusation that "the Church was fallible in scientific matters" or Teilhard's wish that we possess "absolute physical certainty that the stellar universe is not centered on the earth." Yet Winschel and many other 20th century Catholics grew up with Mivart's and Teilhard's self-satisfied assurance about science. Winschel is the typical example of the modern Catholic who comes to the theological debate having already been primed and molded by the biased scientific education he received from childhood. Having been reared with the idea in either public, private or parochial schools that the Earth revolves around the sun at such an impressionable age, it is unfathomable for most of them, now adults, to contemplate that the *status quo* of modern science could possibly have gotten it wrong. So ingrained has the notion of heliocentrism been wired into the consciousness of this generation that otherwise good Catholics think nothing of impugning ulterior motives onto the very popes that God gave to protect them from the false ideas and irreligious prejudices of the world. In short, once the true pontiffs are eliminated from the discussion because they didn't speak "infallibly," a new and different ecclesiastical leader arrives on the landscape, yet his fallibility is not even questioned. His name is Galileo, pope of the church of Scientism, who, being so powerful, even speaks from the grave, as his ideas on scriptural interpretation, Winschel pleads, are even enshrined in "several papal encyclicals":

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[810] Teilhard de Chardin, "Fall, Redemption and Geocentrism," *Christianity and Evolution*, 1969, 1971, William Collins Co., Harcourt, pp. 37-38.

[811] *Retrying Galileo*, pp. 260-261.

> …Galileo was right about heliocentrism. Moreover, some of his theological wanderings eventually found themselves mirrored in several papal encyclicals of the last two centuries. *Providentissimus Deus* by Leo XIII and *Humani Generis* by Pius XII, for instance, both have pieces that could have been extracted from Galileo's *Letter to the Grand Duchess*.[812]

As much as he appeals to the encyclicals for support for heliocentrism, unfortunately Winschel has already demoted their authoritative value since his article inadvertently consigns all non-infallible papal statements to the ambiguous category of "it could be true, but then again, it could be false," due to his hasty and scientifically biased conclusion about Pope Urban VIII and his "wounded pride." As we saw in Pope Urban's dialogue with the ambassador to Archduke Cosimo Medici, Francesco Niccolini, the only "pride" Urban had was for the word of God, the very word he consistently accused Galileo of violating. Contrary to Winschel's claim, there is not a shred of evidence that Urban's personal pride was at stake. Moreover, as we have already noted, the encyclicals of Leo XIII and Pius XII say nothing supporting heliocentrism. They are merely exhortations on the proper interpretation of Scripture that the tradition of the Church had been preaching and practicing since the time of the Church Fathers, and which can be applied to a number of literary situations in Scripture (personifications, irony, metaphors, hyperbole, anthropomorphisms, *etc*.) without once involving the 17th century cosmological controversies. It is only modern Catholics who consistently eisegete these encyclicals into supporting their previously made-up minds about the merits of heliocentrism and the demerits of the 17th century Church.

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[812] *Ibid.*

As much as Winschel bases his apologetic on the "disreputable" acts, "wounded pride," and "exaggerations" of Urban VIII,[813] perhaps he did not investigate to any satisfactory depth the personal life of Galileo before he wrote his article. As we noted in Chapter 13, Galileo was the epitome of a selfish, immoral and prideful man who trampled over anyone and anything to get what he wanted. This was par for the course for the world's pioneering heliocentrists (*e.g*., Copernicus, Galileo, Kepler, Newton, Einstein). As we also noted in Chapter 13, their personal lives are a sordid tale of malfeasance and deception. But Urban VIII, Robert Bellarmine, and the whole employ under Paul V and Alexander VII led exemplary lives that were far and away superior to the scurrilous life of Galileo and his contemporaries. As it stands, Urban VIII was precisely on target in calling Galileo's onslaught "the worst scandal in the history of the Church." The troubles stemming from Winschel's "Western Schism," the "Protestant Revolution," the "Thirty Years War" and the "Renaissance Era" were based on one main issue: the Church's sole and lofty role as the final authority on the interpretation of Scripture, the authority contested by each of the aforementioned epochs of history. The "filioque" issue that divided East from West was based on the interpretation of Scripture.[814] The Protestant Revolution was based on the interpretation of Scripture.[815] The Thirty Years War was between Catholics and Protestants and stemmed directly from religious disputes about Scripture, even though later it digressed into the desire to wrest control from the Hapsburg dynasty. The Galileo affair is the key to understanding each of these historical controversies, since the main contention between the Church and Galileo was not whether there was proof of heliocentrism, for everyone knew that none existed, but over who had the final say on the interpretation of Holy Scripture.

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[813] An accusation against Urban VIII that, as we cited earlier in Finocchiaro's analysis, is most likely a myth since there is no credible documentation.

[814] "Filioque" concerned whether the Holy Spirit proceeded from the Father only or from the Father and the Son. The East sided with the former, the West, under the Roman Pontiff, sided with the latter. The issue of contention was the interpretation of Jn 15:26: "But when the Paraclete cometh, whom I will send you from the Father, the Spirit of truth, who proceedeth from the Father, he shall give testimony of me," as opposed to Rm 8:4: "the Spirit of Christ."

[815] Romans 3:28, James 2:24; 5:14; Matthew 16:18-19; 19:9; John 3:5; John 20:23; 2 Timothy 3:16 and many more.

It is obvious that Winschel's apologetic has a severe set of problems. Instead of viewing papal infallibility as merely the highest expression of a given truth, this Catholic apologist has created an unbridgeable chasm between doctrines that are infallible over against those that are authoritative, but which, as far as he sees it, contain the ticking time bomb of damnable error. As such, this defeatist apologetic invariably leads the Catholic faithful to doubt the truth and veracity of magisterial statements that are not disseminated infallibly. If the people are taught that previous popes were in error simply because they did not couch their teachings in infallible terminology, what would stop the Catholic faithful from becoming just as wary about the possibility of papal error coming from all other venues of Catholic teaching?

It is certainly true that these questions may be somewhat diffused by appeal to: (1) the tradition of the Church, (2) the analogy of faith, (3) the consensus of the Fathers, (4) previous magisterial statements that set an authoritative precedent, (5) the teachings of Scripture, and which often give the needed authoritative backing to non-infallible teachings. But the main problem for those seeking to eliminate the Church's condemnations of heliocentrism from the category of the infallible is that each of the five above authoritative sources unequivocally supports geocentric doctrine. It is an undeniable fact of Catholic history that Scripture, Tradition and the Magisterium have all given their undivided endorsement of geocentric cosmology. Hence, denials of the infallibility of geocentric teachings that then reduce those same teachings to the Church's non-infallible level of authority provide no escape for those advocating heliocentric cosmology. In fact, there is no Scripture, no Tradition and no Magisterial statement in all of the past two thousand years that either denies geocentric cosmology or promotes heliocentric cosmology.

As we have seen, at no time has the Church ever formally and officially reversed the 17th century decrees against heliocentrism. Although it is perhaps true from a procedural standpoint that the removal of Copernicus and Galileo from the 1835 *Index* of Gregory XIV may give a polite pass to the two scientists even though the removal was made under false pretenses, the fact remains that the 1633 *doctrinal decision* that heliocentrism was "formally heretical" and "erroneous in faith" has never been rescinded. It was under the aegis of a canonical trial, a trial that, according to the Congregation of the Index's answer to Joseph LaLande in 1765, must be officially rescinded before any lifting of the condemnation against either heliocentrism or Galileo could possibly occur. Moreover, since the doctrinal decision was determined and came *prior to* what actually appears in the *Index* itself, which is proven by the fact that Urban VIII had these words read to Galileo:

> Invoking, then, the most holy Name of our Lord Jesus Christ, and that of His most glorious Mother Mary ever Virgin, by this our definitive sentence we say, pronounce, judge, and declare, that you, the said Galileo…. having believed and held a doctrine which is false and contrary to the sacred and divine Scriptures – to wit, that the sun is in the center of the world, and that it does not move from east to west, and that the earth moves, and is not the center of the universe; and that an opinion can be held and defended as probable **after** it has been declared and defined to be contrary to Holy Scripture.[816]

This means that the Catholic Church is left with official papal teachings and/or approvals classifying heliocentrism as "formally heretical" and "erroneous in faith" that cannot be dismissed by a mere maneuvering of the 1835 Index. Indices can revise Indices but they cannot reverse or revise canonical trials. Additionally, if it is claimed that the 1633 decision was erroneous, it can also be asserted that the 1835 Index was erroneous. There simply is no escape from this logic.

Much more favorable to geocentric cosmology among Catholic writers is Dr. Wolfgang Smith, Professor emeritus from the Massachusetts Institute of Technology (whom we have already cited at length), and Fr. Victor P. Warkulwiz, who has a Ph.D. in Physics, and writes:

> …We have that revelation in Genesis. To accept the big bang theory is to repudiate Genesis….Militant atheists espouse the cosmological principle because it removes earth from the center of creation. They see this as a step toward dethroning man as the masterpiece and master of creation, the standpoint of Genesis….The centrality of man was expressed geometrically in the Christian medieval cosmos by having the earth at rest, with the sun and the heavens moving around it….Einstein maintained that he succeeded in eliminating the notion of absolute motion in his theory of general relativity, making the notion "at rest in space" open to definition. But God had already made that definition. Scripture informs us that God established the earth as a standard of rest….The earth is at the center of the universe because it is a place in the universe with special properties, just

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[816] The sentence of 1633 against Galileo, approved by Pope Urban VIII, and sent out to all the papal nuncios and their underlings in Europe.

> as geometric centers and centers of mass are places with special properties. God created the earth first, built the rest of the universe around it, defined it as the standard of rest, and made it the home of man…[817]

2010: *Catholic Culture*, Dr. Jeffrey Mirus

Jeffrey Mirus is a Catholic apologist for the organization *Catholic Culture*.[818] He has been chosen as an example of Catholic apologetics regarding the Galileo issue mainly because he has a Ph.D. from Princeton University in Intellectual History and would thus be expected to provide a scholarly assessment of the history. Unfortunately, as is the case with most Catholic apologists who have addressed the Galileo issue, Mirus' bias is evident from the beginning, since he has accepted the popular belief that heliocentrism is a fact of science, although he possesses no degrees in science and claims no specific knowledge of the scientific issues to support that conviction.

Mirus' scientific bias inevitably extends into his conclusions from the research he did into the ecclesiastical issues. His main error is the claim that the Church did not intend to teach geocentrism and therefore there are no repercussions to either the infallibility of the papal office or the requirement of Catholics to follow the non-infallible teachings of the magisterium. In presenting this novel approach to the issue, it would be safe to say that Dr. Mirus believes he has found the ultimate answer to explain the Galileo affair, and from this vantage point he feels confident that Catholics need not be concerned about this era of history any longer.

Mirus argues the following thesis:

> On the one hand, it is argued that the Church has never claimed it made an infallible pronouncement in the Galileo case (the pope was not speaking infallibly). On the other, it is suggested that the Church has never claimed to be infallible in matters of science, but only in faith and morals. Both of these Catholic counter-arguments seem to me to be unsatisfactory. The latter argument fails because, in fact, if Galileo's propositions were condemned,

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[817] Victor P. Warkulwiz, *The Doctrines of Genesis 1-11*, 2007, pp. 66-68.

[818] His website is http://www.catholicculture.org

they were condemned precisely because they were heretical or erroneous in faith. Surely it extends to the Church's infallibility to know what is and what is not a matter of faith; otherwise, the doctrine is an absurdity. The former argument, on the other hand, is acceptable only to those with a minimist view of infallibility, for it generally assumes that Galileo's condemnation was an act of the ordinary, but not the extraordinary, Magisterium of the Church.

But Vatican II said Catholics must give the ordinary Magisterium "a religious submission of mind and will" (Lumen Gentium, 25), and this teaching presents a problem. After all, the chief traditional argument for papal infallibility has been that since all Catholics are obliged to believe the pope when he teaches formally on faith or morals, the pope must be infallible, else the whole Church would fall into error, which is impossible. However, if "a religious submission of mind and will" is also due the ordinary magisterium, then we must conclude that, in matters of faith and morals at least, there is a strong case for development in the doctrine of infallibility by its application to the ordinary Magisterium of the Church. Thus if it is true that in the Galileo case the ordinary Magisterium condemned the scientist's propositions as errors in faith, the credibility of the Magisterium would appear to be affected.

Having cleared the air, therefore, we can turn to the decisive question. Is the authority of the ordinary Magisterium of the Church impugned by the condemnation of Galileo's theories as heretical? Other questions are merely peripheral; this alone is the crucial point; and a brief survey of the actual facts of the case solves the problem immediately.

On February 19, 1616, the following two propositions advanced by Galileo were submitted by the Inquisition to the Holy Office for advice regarding their orthodoxy (Santillana, 120):

1. "The sun is the center of the world and hence immovable of local motion."
2. "The Earth is not the center of the world, nor immovable, but moves according to the whole of itself."

On February 24th, the experts (qualifiers) of the Holy Office found the first proposition "foolish and absurd, philosophically

> and formally heretical, inasmuch as it expressly contradicts the doctrine of the Holy Scripture in many passages, both in their literal meaning and according to the general interpretation of the Fathers and Doctors." They declared the second "to receive the same censure in philosophy and, as regards theological truth, to be at least erroneous in faith." That there were competent theologians even then who argued against the views expressed here suggests that the qualifiers could have reached a wiser conclusion. Theirs is the chief fault in the entire affair.

As we can see, Mirus wants to shift the weight of the incident to the eleven cardinals assigned by Paul V in 1616 to investigate Galileo's claims. He begins his argument by presuming the eleven cardinals did, in fact, err in their judgment against Galileo (but, as it appears, Mirus chooses to relieve Pope Paul V of any responsibility). Mirus never proves that the eleven cardinals erred. He only presumes they erred and he expects his reader to accept his judgment. But in order to accept Mirus' judgment, a critical reader will require him to provide both scientific and eccelesiastical arguments in his favor. Mirus does neither. Although we can understand why he does not address the scientific arguments (since he does not know them), Mirus is derelict in his duty as a historian since he also ignores the historical and ecclesiastical arguments that would put his presumption in doubt.

For example, Mirus ignores the fact that the eleven cardinals were bound to the Tradition of the Church. Just sixty years earlier, Pope Pius V had already affirmed, in four separate places of the 1566 Tridentine catechism, that geocentrism is the teaching of the Church.[819] Just six years prior, in 1559, Pius IV put both Copernicus' and Rheticus' books on the *Index of Forbidden Books* since they both taught heliocentrism. Prior to that, Thomas Aquinas and all the medieval theologians taught geocentrism. Scripture itself, of which the Church possessed a time-honored tradition of interpreting literally, was replete with references to a moving sun and a stationary earth. Hence, Mirus is confronted with a very serious historical question: What other evidence existed in the Tradition of the Church that would have lead these eleven qualifiers to make a "wiser" conclusion than what they already decided from their reflection on the 1600 years of Church teaching prior to their commission? We can answer the question for him: There is no other evidence.

At this point, Mirus, if he decides to consider the history prior to the eleven cardinals, will, according to his thesis, be required to indict the Church Fathers, the medievals, Pius IV, Pius V, and the Tridentine catechism as holding what he defines as "the chief fault." The eleven cardinals did not arrive at their decision against Galileo in a historical vacuum, but Mirus seems to do his best to give that very impression, since he mentions none of the prior ecclesiastical history. This is nothing new. Catholics who are bent on preserving the scientific *status quo* invariably try to revise the Catholic history by isolating their favorite ecclesiastical villain and making it appear as if he alone was the fly in the ointment. Many do the same with Pope Urban VIII who presided over Galileo's 1633 trial by making it appear as if he had some irrational vendetta against Galileo. Others try to isolate Cardinal Bellarmine by claiming that he knew nothing about science and that he was obtuse in insisting on a literal interpretation of Scripture. Others, including the 1992 papal speech to the Pontifical Academy of Science, attempt to lay the blame on nameless and expendable "theologians," without once mentioning the personal investigations and official approval against Galileo by Pope Paul V and Pope Urban VIII. Mirus' attempt to lay the blame solely on the eleven cardinals is novel, but it will also fail since, similar to the failures of the other apologists, the Church's history prior to and during the Galileo affair will simply not allow such blatant revisionism.

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[819] See our previous section dealing with the 1566 Tridentine catechism.

As is apparent, Mirus has failed to support his argument by a scholarly analysis of the ecclesiastical history, and he certainly isn't qualified to give us a critical analysis of the scientific claims for heliocentrism. As such, his arguments are discredited. The reality is, the qualifiers did precisely what we would expect faithful leaders of the Church to do. They diligently listened to the Fathers, Thomas Aquinas, Pius IV, Pius V, and the Tridentine catechism and concluded that heliocentrism was an integral part of the Tradition and was the official Catholic teaching for 1600 years prior. Since there were no scientific facts refuting the Tradition, they held on to their conclusion all the more. Unfortunately, Mirus makes it appear as if the qualifiers were working in a historical and spiritual vacuum.

Mirus then takes up the issue concerning the sentence against Galileo:

> This sentence is interesting for two reasons. First, it marks the first time that the declaration of heresy by the qualifiers of the Holy Office (of February 24, 1616) was published, it being adduced as expert testimony in the history of Galileo's case. That it had never been promulgated on its own is of some importance. Second, the sentence itself bears the signatures of seven of the ten judges; the Pope, in other words, did not officially endorse the decision (there was, of course, no reason why he should, since the Court was simply exercising its normal powers).

Mirus displays a common mistake among Catholics when dealing with the Galileo affair. It is presumed the pope is required to sign a document in order for his decision to be authoritative or official. Although it would certainly help if the pope put his signature to a document, there is nothing in canonical law that says a pope is limited to signing a document in order to make his teaching authoritative or official. As long as the pope's wishes are affirmed by witnesses, it is official and binding. Although there are many occasions in which documents are signed by the pope, this does not mean the pope is limited to signing his name. A signature only makes the pope's view clearer and easier to verify, but it does not limit the pope in how he may issue a decision. If it can be shown that the pope's solemn will was manifested, it is as legal as if he signed his name.

Mirus also uses another common but fallacious argument – that Pope Paul V was not much involved in the Galileo affair. As we have noted, however, the historical record demonstrates the exact opposite:

- Paul V assembled eleven cardinals who condemned the Copernicanism of Fr. Foscarini in 1615 as being "formally heretical."
- Paul V was heavily involved in 1616 creating the canonical injunction forbidding Galileo to speak or write about Copernicanism.
- On February 25, 1616, Pope Paul V ordered Cardinal Bellarmine to summon Galileo and, "in the presence of a notary and witnesses lest he should prove recusant, warn him to abandon the condemned opinion and in every way abstain from teaching, defending or discussing it."
- This was followed by a formal decree issued on March 5, 1616. According to the wording of the decree, Paul V's and Bellarmine's rejection of Copernicanism was not considered some private affair between them and Galileo. The decree stated very clearly that its information was to be "published everywhere" and that its specific audience was the "whole of Christendom." Note these words: "Decree of the Sacred Congregation of the most Illustrious Cardinals of the Holy Roman Church specially delegated by Our Most Holy Lord Pope Paul V and the Holy Apostolic See to publish everywhere throughout the whole of Christendom." (Decretum Sacrae Congregationis Illustrissimorum S.R.E.Cardinalium, a S.D.N. Paulo Papa V Sanctaque Sede Apostolica ad Indicem librorum)

That Paul V and Cardinal Bellarmine were of one mind on censoring Galileo and heliocentrism was revealed no better than in a letter written by the Tuscan ambassador in Rome, Piero Guicciardini, to Grand Duke Cosimo II, dated March 4, 1616. According to Finocchiaro's assessement, "Guicciardini appeared to have some inside information about the proceedings [against Galileo], since his position as ambassador gave him direct access to the pope himself as well as to cardinals and other well-connected diplomats." After verifying Guicciardini's factual knowledge of the pope's mind, Finocchiaro concludes: "The letter observes that Pope Paul V and Cardinal Bellarmine agreed that Copernicanism was erroneous and heretical. This was and remains precious information."[820]

The significance of the pope's part in the proceedings and the strictness of the admonition given to Galileo are made even more relevant in a second document Bellarmine wrote, a document that was rediscovered sixteen years later in the reign of Pope Urban VIII. This particular document mentions the "Commissary of the Holy Office," Michelangelo Segizzi, "in the name of his Holiness the Pope," as giving Galileo a legal "injunction" to refrain from asserting that the Earth moves. It reads:

> Friday, the 26th of the same month [February 1616], at the palace, the usual residence of the said Most Illustrious Lord Cardinal Bellarmine, and in the chambers of His Most Illustrious Lordship, and in the presence of the Reverend Father Michelangelo Segizzi of Lodi, O. P., Commissary of the Holy Office, having summoned the above-mentioned Galileo before himself, the same Most Illustrious Lord Cardinal warned Galileo that the above-mentioned opinion was erroneous and that he should abandon it; and thereafter, indeed immediately, before me and witnesses, the Most Illustrious Lord Cardinal himself being also present still, the aforesaid Father Commissary, in the name of His Holiness the Pope and the whole Congregation of the Holy Office, ordered and enjoined the said Galileo, who was himself still present, to abandon completely the above-mentioned opinion that the sun stands still at the center of the world and the earth moves, and henceforth not to hold, teach, or defend it in any way whatever, either orally or in writing; otherwise the Holy

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[820] As stated in Retrying Galileo, pp. 158-159. The March 4, 1616 letter from Guicciardini to Cosimo II was not published until 1773 by Angelo Fabroni in Lettere inedited di uomini illustri, Florence, two volumes, 1773-1775.

> Office would start proceedings against him. The same Galileo acquiesced in the injunction and promised to obey.[821]

As we can see, both popes who handled the Galileo affair were heavily involved, both behind the scenes and in official forums, in both Galileo's condemnation and the rejection of heliocentrism as a viable cosmology. Any attempt to lessen their involvement is a clear attempt at historical revisionism.

Mirus then proposes a totally novel approach to the Church's condemnations of Galileo and heliocentrism:

> The conclusions to be drawn are perhaps obvious. First, the declaration that Galileo's propositions were heretical was never published as a teaching of the Church, and it was never intended to be such. It was intended and taken as the advice of certain theological experts who worked in the Holy Office, of value in a legal case, but hardly a norm of faith for the Church as a whole.

Mirus apparently believes that the condemnation of heliocentrism as "formally heretical," which was approved by Pope Paul V, was never intended to apply to anyone else in the Church except Galileo; and, consequently, the pope and his commission of eleven cardinals would have allowed any parishioner to believe and teach heliocentrism, except for Galileo, Foscarini and Zuniga. Mirus neither provides us with a rationale for this irrational argument, nor cites any instance when the Church allowed its parishioners to teach or learn heliocentrism after it condemned Galileo.

For the sake of argument, let's allow Mirus to use such legalese. If we do, we will quickly see that it will only come back to disqualify itself in the case of Pope Urban VIII who, in 1633, had the results of Galileo's trial bound, published, and sent to all the papal nuncios and universities of Europe demanding allegiance to the condemnation of heliocentrism, including the words "formally heretical" that he preserved from the judgment of the eleven qualifiers in 1615. The following is a sampling of historians who show how involved Pope Urban VIII was in disseminating his decree all over Europe:

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[821] *Le Opere di Galileo Galilei*, Antonio Favaro, vol. 19, pp. 321-322, translated by Annibale Fantoli in *The Church and Galileo*, pp. 119-120; the same version in Maurice Finocchiaro's *The Galileo Affair*, p. 147. An injunction is a formal order from a court of law or canonical court ordering a person or group to do or not do something.

> Pope Urban had no intention of concealing Galileo's abjuration and sentence. Instead, he ordered copies of both to be sent to all inquisitors and papal nuncios that they might notify all their clergy and especially all the professors of mathematics and philosophy within their districts…[822]

Another says:

> In the summer of 1633 all papal nuncios in Europe and all local inquisitors in Italy received from the Roman Inquisition copies of the sentence against Galileo and his abjuration, together with orders to publicize them. Such publicity was unprecedented in the annals of the Inquisition and never repeated. As a result, many manuscript copies of Galileo's sentence and abjuration have survived in European archives. By contrast, no copies of the full text of the Inquisition's sentence against Giordano Bruno survive, even though his crime…and his penalty…were much more serious….From the replies of the nuncios and inquisitors, there is concrete evidence that the sentence circulated in the manner intended. Letters of reply have survived from the nuncios to Naples, Florence, Venice, Vienna, Paris, Brussels, Cologne, Vilnius, Lucerne and Madrid, and from the inquisitors of Florence, Padua, Bologna, Vicenza, Venice, Ceneda, Brescia, Ferrara, Aquileia, Perugia, Como, Pavia, Siena, Faenza, Milan Crema, Cremona, Reggio Emilia, Mantua, Gubbio, Pisa, Novara, Piacenza, and Tortona. The most common reply was a brief acknowledgment of receipt and a promise that the orders would be carried out. However, in this case the standard response was not sufficient for the Inquisition. It expected to be notified that the orders had in fact been carried out. Those who did not send such a follow-up letter were soon reprimanded and had to write back to Cardinal Barberini to explain the oversight of the delay….The quickest promulgation occurred in university circles.[823]

Continuing his line of argument, Mirus writes:

> Second, as noted earlier, Pope Paul V did not endorse this theological opinion, but rather ordered in an in-house directive

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[822] Dorothy Stimson *The Gradual Acceptance of the Copernican Theory of the Universe*, 1917, pp. 67-68.

[823] *Retrying Galileo*, pp. 26-28.

> only that Galileo be commanded to stop holding and advancing his own opinion. This action, then, stemmed from a judgment of prudence about the promotion of ideas which could not be easily reconciled with Scripture. Even as a private document, therefore, the declaration of heresy received no formal papal approval. Third, there is no evidence that Pope Urban VIII ever endorsed any public document which included the declaration of heresy, especially the sentence at Galileo's trial. That no pope ever promulgated any condemnation of Galileo's ideas removes the Galileo case entirely from discussions on the historical character of the Church's teaching authority.

Contrary to Mirus' assessment, if there is anything clear from the historical record it is Pope Urban VIII's "endorsement" of the declaration of heliocentrism as a formal heresy. Not only do we possess the letters that Urban VIII sent to all of Europe, we also have his protracted conversations with the Grand Duke of Tuscany over the course of six months, in which the pope specifies to the Grand Duke that heliocentrism is a heresy that will destroy the Church unless it is stopped.

Not only do we have Urban VIII's public dissemination of the decrees against Galileo and heliocentrism, we also know that Europe regarded these condemnations as the teaching of the Catholic popes. For example, between 1739 to 1742, when the three-volume edition of Isaac Newton's *Principia* was published in Geneva, the Preface contained a disclaimer, or what was then known as a "Declaratio," stating that although Newton assumed the heliocentric system to be true, this was not the belief of the editors, Le Seur and Jacquier, who represented the Catholic Church. All the editions carried this wording:

> Newton in his third book assumes the hypothesis of the earth's movement. The author's [Newton's] propositions could not be explained except on the same hypothesis. Hence we have been obliged to put on a character not our own. But we profess obedience to the decrees made by the Supreme Pontiffs against the movement of the earth.

Seemingly oblivious to these facts, Mirus continues in the same vein:

> It is clear, then, that not even the ordinary Magisterium has ever taught or promulgated the idea that the propositions of Copernican-Galilean astronomy are heretical or errors in faith. Thus it can in no way be claimed that "the Church" has taught that such views are heretical. To make such a claim would

> require that we locate the teaching authority of the Church in those theologians who claim expertise, a mistake which many make today, but one which the Galileo case should, at long last, serve to correct.

The "mistake," as we have clearly seen from the documented evidence, is Mirus,' for it is quite evident from the historical record that the popes took a very active role not only in teaching geocentrism and facilitating the condemnation of Galileo and heliocentrism, but also in publicizing their conclusions far and wide. They were following the teaching set by the Church Fathers in unanimous consent (as Bellarmine informed Galileo) and that tradition continued in the Ordinary magisterium up to and beyond Galileo's time.

In the end, Catholic apologists would have no need to use Mirus' hair-splitting legalese and historical revisionism if they would cease starting their argumentation from the premise that popular science is correct in its conclusions about cosmogony and cosmology. Once one puts his faith in the scientific *status quo*, then one has no choice but to say the Church cannot be infallible. As we have shown, true science (not popular, atheistic-driven science) has provided plenty of evidence that geocentrism is, indeed, correct. The evidence is confronting Catholic apologists directly. They only need look at it and accept it.

Fr. George L. Murphy, Ph.D.

Fr. George Murphy has a Ph.D. in physics from Johns Hopkins University and an MDiv from Wartburg Seminary, so he comes well qualified to discuss the issue of cosmology. In June 2001 his article "Does the Earth Move?" was published in *Perspectives on Science and Christian Faith*.[824] Unlike Dr. Mirus above, Fr. Murphy can well appreciate the scientific issues that impinge on the provocative question he poses about the Earth's movement. Along those lines, Fr. Murphy admits some of the same principles which guided the writing of our volumes. For example, his first paragraph admits that the modern notion of "Relativity" creates a whole different perspective from which to answer the question. He writes:

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[824] Fr. Murphy is a retired pastor for the Evangelical Lutheran Church in America (ELCA). "Does the Earth Move?" was published in Vol. 63, No. 2 of the ELCA's Alliance for Faith, Science and Technology. http://www.asa3.org/ASA/PSCF/2011/PSCF6-11Murphy.pdf

> Einstein's theory of relativity means, among other things, that a modified version of Tycho Brahe's earth-centered model of the planetary system is, in principle, as good as Copernicus' sun-centered model. The question of whether the earth or the sun "really" moves is meaningless in this theory….Einstein's equations for the curvature of space-time due to the sun's mass and the geodesic equations for the worldliness of planets have the same form in both frames and could, in principle, be solve in either one.[825]

Being a follower of Einstein, Fr. Murphy cannot help but admit that "Relativity" neutralizes arguments against geocentrism. It is a humbling experience for relativists to see themselves come full circle in this debate, considering the fact that Einstein invented Special Relativity to avoid the implications of the 1887 Michelson-Morley experiment which showed the Earth was motionless in space, but which then forced Einstein to create his second theory, namely, General Relativity, whose equations are the basis for Fr. Murphy's admission that Tycho's system is "just as good as" Copernicus' system. In fact, Fr. Murphy seems quite disturbed in his article that opponents of geocentrism invariably point to the flaws in the Ptolemaic model and either are ignorant of or conveniently ignore Tycho's model which, as opposed to Ptolemy's, is a mirror image of Copernicus'.

Fr. Murphy not only comes to appreciate geocentrism from the Relativity perspective, but also from the Newtonian, since he knows the 'inside story,' as it were. He writes:

> Accelerated reference frames can be used in Newtonian mechanics at the cost of introducing "fictitious forces." These are simply the negative of "mass times acceleration" terms in Newton's second law moved to the other side of the equation and called forces. Centrifugal and Coriolis forces are examples. Planetary orbits can then be calculated in a fixed-earth frame, but within the Newtonian worldview, the earth is still thought of as "really" moving.

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[825] *Ibid*., pp. 109, 111. Fr. Murphy quotes from the very two sources we cite in the first volume of our series, namely, Einstein/Infeld and Max Born. Fr. Murphy cites Danny Faulkner's article for Answers in Genesis against geocentrism and faults Faulkner for the claim that General Relativity "allows a preferred reference frame" since it "is in spite of an appeal to Mach's principle, wrong," *ibid*., p. 110.

Eventually, however, the article shows that Fr. Murphy is not ready to commit himself to a strict geocentric worldview, even though he has tacitly accommodated it. We see this reticence both in his scientific and biblical analysis. For example, later in his paper Fr. Murphy points out that Tycho wanted the Earth to be non-rotating and have the stars rotating around Earth. But he claims this would not be possible since…

> the linear velocity across our line of sight of an object in such a frame would increase in proportion to its distance from the earth, and an object farther than about 4×10^9 km (somewhat beyond the orbit of Neptune) would be moving faster than light. Thus a frame with a nonrotating earth cannot be used for phenomena beyond a certain distance.[826]

As we have seen in our previous volumes, Fr. Murphy's objection will not stand. In General Relativity rotating frames can assume any speed, and be even faster than light. As noted from relativist William Rosser:

> Relative to the stationary roundabout [the Earth], the distant stars would have a velocity $r\omega$ [radius x angular velocity] and for sufficiently large values of r, the stars would be moving relative to O' [the observer] with linear velocities exceeding 3×10^8 m/sec, the terrestrial value of the velocity of light. At first sight this appears to be a contradiction…that the velocities of all material bodies must be less than c [the speed of light]. However, the restriction $u < c = 3 \times 10^8$ m/sec is restricted to the theory of Special Relativity. According to the General theory, it is possible to choose local reference frames in which, over a limited volume of space, there is no gravitational field, and relative to such a reference frame the velocity of light is equal to c. However, this is not true when gravitational fields are present. In addition to the lengths of rods and the rates of clocks the velocity of light is affected by a gravitational field. If gravitational fields are present the velocities of either material bodies or of light can assume *any numerical value* depending on the strength of the gravitational field. If one considers the rotating roundabout as being at rest, the centrifugal gravitational field assumes enormous values at large distances, and it is consistent with the theory of General Relativity for the velocities

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[826] *Ibid.*

> of distant bodies to exceed 3 × 10^8 m/sec under these conditions.[827]

Although Fr. Murphy also admits that simple mechanical phenomena, such as stellar parallax, can be easily answered by the Tychonic model just as well as the Copernican model, he avoids going to a motionless Earth in the center of the universe because, being a relativist at heart, he is forced to conclude that

> Neither the earth, the sun, nor the whole solar system is at the center of the universe, a concept that does not even have any meaning in modern cosmology. The real issue is not 'centricity' but whether we can adopt a fixed-earth or a fixed-sun reference frame. The answer relativity gives is that we can use either one.[828]

The fact remains, however, that although Relativity will allow either the heliocentric or geocentric systems, reality will only allow one, since both systems cannot be true. Cosmology is not a case of the Excluded Middle (*i.e.*, at least one is true, but both can be true) but the Exclusive Disjunction (*i.e.*, exactly one is true, and the other is false). The reason is simple. Reality does not jump back and forth between a sun-fixed, Earth-fixed, or any-fixed system. It chooses one and remains with it. We know that at least one of these systems must be the reality since we see the sun and stars move across the sky each day. In other words, Relativity will only take us so far. Fr. Murphy must eventually commit to one or the other. In the end, he would rather not make the decision and concludes instead that "Relativity does not deal a 'death blow to Copernicanism.'"[829]

Fr. Murphy then addresses some popular biblical texts and analyzes them in light of his "Relativity" perspective, but by his own admission he is rather limted in doing so because the ancients did not know anything about Relativity theory. As Fr. Murphy sees it, Ecclesiastes 1:5 can claim the sun rises and sets because, scientifically speaking, the "use of such a frame would imply a speed for the sun of about 4% that of light does not mean that there is any fundamental problem with it." He doesn't do as well with Joshua 10:12-14 since he chooses not to give a scientific answer; rather, he seeks to relegate the text to a form of poetry similar to that of "stars fighting from heaven" in Judges 5:20. We have seen in Chapter 14, however, that Joshua 10:12 and Judges 5:20 are two different kinds of texts, the former not lending itself to being poetic since a non-literal event would destroy the whole context of why Joshua called on the sun to stand still in the first place, whereas Judges 5:20 is obviously poetic language in a context that is filled with poetic language.

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[827] *An Introduction to the Theory of Relativity*, William G. V. Rosser, 1964, p. 460, italics and comments in brackets added. Rosser adds: "Relative to an inertial frame the 'fixed' stars are at rest or moving with uniform velocity. However, relative to a reference frame accelerating relative to an inertial frame the stars are accelerating. It is quite feasible that accelerating masses give different gravitational forces from the gravitational forces due to the same masses when they are moving with uniform velocity. Thus the conditions in an accelerating reference frame are different from the conditions in inertial frames, since the stars are accelerating relative to the accelerating reference frame. It seems plausible to try to interpret inertial forces as gravitational forces due to the accelerations of the stars relative to the reference frame chosen."

[828] *Ibid.*, p. 112.

[829] *Ibid.*

Fr. Murphy then attempts to answer the passages which speak of the Earth as being immovable by claiming that "The point of these texts is the praise of God, and the emphasis is really on the durability of God's reign."[830] But Fr. Murphy fails to see that the "point" of the durability or immovability of God's reign is driven home much more effectively when it is compared to a fact already known by the ancients – the immovability of the Earth. As such, ancient man could safely conclude that God was as immovable as the Earth was immovable, and the Psalmist therefore accomplishes his goal of praising God. The same could not be said if the Earth moved, since the Psalmist would then be implying that God was moveable – the very thing he wants to avoid.

All in all, Fr. Murphy's view is a step in the right direction, but it is far from adequate as an apologetic for either geocentrism, biblical interpretation, or even the full implications of Relativity theory.

"The Catholic Church Does Not Teach Geocentrism Today"

Some Catholics depend on the argument that if geocentrism is a teaching of the Church, then the Church would be explicitly teaching geocentrism today. Since the Church does not teach it, then geocentrism is no longer an official teaching, and has been replaced by heliocentrism and evolution, which are taught in most Catholic schools today.

Besides the fact that this argumentation invariably pits the decisions of the traditional Church directly against the practices of the modern Church, the deeper question revolves around whether the Church can teach something today that She hasn't taught in the past, or is different than what She taught in the past; and if She does so, is the new teaching true and official? The answer will depend on whether supporting examples exist that show the Church has, for all intents and purposes, ceased teaching a particular doctrine and seemingly replaced it with another, yet without either issuing an official reversal of the previous doctrine or an official endorsement of the new doctrine. Additionally, once the breach has been discovered and investigated, did the Church restore the former teaching to its rightful place?

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[830] *Ibid.*, p. 113.

1) The Tridentine Mass

There are several such instances in the history of the Church, many of them very recent. For example, most of the Church hierarchy in the mid-twentieth century believed the Tridentine Mass was abrogated by Pope Paul VI. Hence, the Church disallowed the Tridentine rite for many years, never officially celebrating it since 1969. In 1988, John Paul II's *Ecclesie Dei* commission restored the Tridentine to a certain degree, but most clerics were still under the impression that Paul VI had abrogated the Tridentine rite in 1969. Due to pressure from traditionalist Catholics, Pope Benedict XVI then established a commission to investigate whether Paul VI had, in fact, abrogated the Tridentine rite. It was determined that he had not done so, which then led Benedict XVI to fully reinstate the Tridentine, which was published in his *motu proprio* (*i.e.*, "on his own initiative") titled *Summorum Pontificum* (*i.e.*, "of the Supreme Pontiffs") in July 2007. Thus for thirty-eight years the highest members of the Church had mistakenly believed (or perhaps pretended to believe) that something was true when it was actually false. It is our belief that the same will be the case with the Church's teaching on geocentrism. If and when the Church does reinvestigate the issue, She will find that the condemnation of heliocentrism has never been officially abrogated, and, in light of the burgeoning scientific evidence that shows there is no proof for heliocentrism and much evidence for geocentrism, She will be required to restore the latter to its rightful place in Church teaching.

2) Usury

Another example of a doctrine that has not officially been abrogated but unofficially replaced by another belief system is usury (*i.e.*, demanding interest on a loan). The Church's tradition, capped by Her leading theologian, Thomas Aquinas, taught against usury and the doctrine was officially proclaimed in Pope Benedict XIV's 1745 encyclical, *Vix pervenit*.[831] The modern Catholic Church, however, does not promote the traditional teaching against usury but it also does not cite any official declaration that the traditional teaching has been abrogated. The closest the modern Church even addresses usury is in two citations of the 1994 *Catechism of the Catholic Church*, but these are very superficial and do not cite *Vix pervenit* as the Church last official teaching on the matter.[832]

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[831] "The nature of the sin called usury has its proper place and origin in a loan contract… [which] demands, by its very nature, that one return to another only as

Hence, we have another case in which a doctrine of the Catholic Church is either ignored, has fallen into disuse, and/or replaced by a more modern belief, yet without an official abrogation of the previous doctrine or any official teaching of the new belief.

3) Biblical Inerrancy

A third example is the Church's teaching on biblical inerrancy. Prior to the aftermath of Vatican Council II, it can be conclusively shown that the Catholic Church officially taught that Scripture was inerrant not only in its salvation message, but also in its record of historical events. As we have noted, this doctrine was unofficially abandoned in the wake of Vatican II's decree on Holy Scripture, titled *Dei Verbum*, which stated the following in paragraph 11:

> Since, therefore, all that the inspired authors, or sacred writers, affirm should be regarded as affirmed by the Holy Spirit, we must acknowledge that the books of Scripture, firmly, faithfully

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much as he has received. The sin rests on the fact that sometimes the creditor desires more than he has given…, but any gain which exceeds the amount he gave is illicit and usurious.'One cannot condone the sin of usury by arguing that the gain is not great or excessive, but rather moderate or small; neither can it be condoned by arguing that the borrower is rich; nor even by arguing that the money borrowed is not left idle, but is spent usefully…" (*Denz*. 1475). See also Innocent II, Lateran Council I, 1139, *Denz*. 365; Urban VIII, 1107, *Denz*. 403; Clement V, Council of Vienne, *Denz*. 479; Innocent XI, March 4, 1679, *Denz*. 1190-1192

[832] There are only two entries in the catechism's Index on usury. The first is paragraph 2269, which merely states that "usurious and avaricious dealings lead to the hunger and death," and paragraph 2449, which although it cites the "juridical measures" of the Old Testament, which includes the "prohibition of loans at interest," it does not specifically state that in the modern age loans at interest are morally wrong, but only digresses into a general teaching about caring for the poor. The catechism's teaching seems to be that usury is only wrong when the interest on the loan is exorbitantly high, as is the case with mainstream Catholic thinking today, but that is not what is taught in either the Old Testament or in *Vix pervenit*, which both held that *any* interest on a loan is not permitted. See the article at http://distributistreview.com/mag/2012/01/is-usury-still-a-sin/ for more information.

> and without error, teach that truth which God, for the sake of our salvation, wished to see confided to the sacred Scriptures.

This sentence is interpreted today so as to limit inerrancy to the material in Scripture dealing directly with salvation, thus discarding the Church's previous belief that Scripture's accounting of history was protected by the inspiration of the Holy Spirit. The Church has neither made an official declaration that this novel view of Scripture is the current and official doctrine, nor did She make any official declaration that the Church's previous belief in full biblical inerrancy was incorrect or is no longer an official Church teaching. The belief that Scripture is only inerrant with regards to salvation just quietly seeped into the consensus of the modern age without firing a shot, as it were. It is now the case that almost all Catholic academic institutions in the world, including elementary, high school, college and seminary, as well as being the common belief of many high-placed clerics in the Vatican itself, teach the new belief of partial inerrancy as if it were official Church doctrine.

4) The Social Kingship of Christ

A fourth example is the doctrine of the Social Kingship of Christ taught by Pope Pius XI in his 1925 encyclical *Quas Primas*.[833] Previous to Pius XI the Church taught the Social Kingship of Christ in numerous papal encyclicals and conciliar doctrines. Today there are a majority of clerics and lay Catholics who openly defy these encyclicals as examples of the Church's primitive era and thus unapplicable to today's society.[834]

5) Six-day, *ex nihilo*, creation

A fifth example is the Church's teaching on Creation. Up until the aftermath of Vatican II, it was common for Catholics to hold the belief that God created the world in an *ex nihilo*, instantaneous and miraculous creation, occurring over six days. This belief followed a long tradition stemming from the consensus of the Church Fathers through the medieval age, and was made official both by Lateran Council IV and Vatican Council I.[835] Today, except for small pockets of traditional Catholics, hardly any modern Catholic holds to a six-day miraculous creation. Most believe in evolution and the Big Bang theory advocated by the majority of mainstream scientists.

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[833] See the official encyclical at http://www.papalencyclicals.net/Pius11/P11PRIMA.HTM

[834] See, among others, George Wiegel and Joseph Bottum (speaking for Richard John Neuhaus) on EWTN at http://www.youtube.com/watch?v=LqZ2ybiDlaw.

[835] See Denzinger §428 and §1805. The 1911 Catholic Encyclopedia is decidedly negative toward evolution. It states the following: "The most important General

6) Contraception

A sixth example is contraception. Prior to the mid- to late twentieth century, the Catholic Church taught, and most Catholic parishioners practiced, no form of contraception. It was the very reason that Catholics were known for having large families. This teaching was reinforced by Pope Pius XI's 1932 encyclical titled *Casti Connubii*. Later, when the teaching against contraception was officially reiterated by Pope Paul VI in the 1969 encyclical, *Humanae Vitae*, it caused one of the greatest ruptures in loyalty and obedience to the Church in history. The common practice among Catholic women today is the use of artificial birth control devices, including abortion, although the Church has never rescinded its teaching against contraception. Even those who practice Natural Family Planning do so without any specific allowance from Humanae Vitae, which only allowed natural contraception in cases of need, not want.

7) Head Coverings

A seventh example is the issue of head coverings for women. Prior to the aftermath of Vatican II, the common belief among Catholics, stemming from the first centuries and through the medieval period, was that women must wear a covering on their head whenever entering the Church. As late as 1917, the Code of Canon Law required head coverings. Today, however, there are very few women who abide by this teaching, and they

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Considerations to be noted are as follows: (1) The origin of life is unknown to science; (2) The origin of the main organic types and their principal subdivisions are likewise unknown to science; (3) There is no evidence in favor of an ascending evolution of organic forms; (4) There is no trace of even a merely probable argument in favor of the animal origin of man. The earliest human fossils and the most ancient traces of culture refer to a true Homo sapiens as we know him today; (5) Most of the so-called systematic species and genera were certainly not created as such, but originated by a process of either gradual or salutatory evolution. Changes which extend beyond the range of variation observed in the human species have thus far not been strictly demonstrated, either experimentally or historically; (6) There is very little known as to the causes of evolution. The greatest difficulty is to explain the origin and constancy of "new" characters and the teleology of the process. Darwin's "natural selection" is a *negative* factor only. The molding influence of the environment cannot be doubted; but at present we are unable to ascertain how far that influence may extend." (Vol. V, pp. 654-670).

do so despite any official statement from the Church that rescinds the custom, including the 1975 CDF document *Inter Insignores* and the 1983 Code of Canon Law.[836] It simply fell into disuse on its own without any official declaration against it.

8) No Salvation Outside the Church

An eighth example is the doctrine *extra ecclesium nulla salus* ("no salvation outside the Church"). As even the 1994 *Catechism of the Catholic Church* admits, the doctrine was taught by the Church Fathers.[837] It was reiterated by both Pope Eugene IV and Pope Boniface VIII (although for some odd reason the *Catechism* fails to cite these two important documents).[838] The teaching is reiterated in the Vatican II document, *Lumen Gentium* 14, as quoted by the same *Catechism*.[839] But the reality is, the doctrine is hardly taught at all in Catholic circles today. More prevalent is the "anonymous Christian" doctrine of Karl Rahner or the "dare we hope" [that all are saved] doctrine of Hans urs von Balthasar, and the whole climate of universal salvation promoted in the aftermath of Vatican II. Protestant and Jews today are considered by many Catholics, lay and hierarchy, to be on the road to salvation just as Catholics. The Jews are even said to have their "own covenant" and salvation plan with God and thus are not to be targeted with Christian evangelism.[840]

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[836] See my essay on this issue, "Women and Head Coverings."

[837] *Catechism of the Catholic Church*, §846.

[838] Denzinger, *The Sources of Catholic Dogma*, Eugene IV, the Council of Florence, (1438 – 1445), §714 "It firmly believes and professes and proclaims that those not living within the Catholic Church, not only pagans, but also Jews and heretics and schismatics cannot become participants in eternal life, but will depart into everlasting fire…"; Boniface VIII (1294 – 1303), *Unum Santum*, §468 "…we firmly believe and confess this Church outside which there is no salvation nor remission of sin."

[839] "Hence they could not be saved who, knowing that the Catholic Church was founded as necessary by God through Christ, would refuse either to enter it or to remain in it."

[840] Walter Cardinal Kasper stated to the International Catholic-Jewish Liaison Committee in New York on May 1, 2001: "The old theory of substitution [i.e., that the New Covenant replaced the Old Covenant] is gone since the Second Vatican Council. For us Christians today the covenant with the Jewish people is a living heritage, a living reality....Therefore, the Church believes that Judaism, i.e., the faithful response of the Jewish people to God's irrevocable covenant, is salvific for them, because God is faithful to His promises....Thus mission, in this strict sense, cannot be used with regard to Jews, who believe in the true and one God. Therefore – and this is characteristic – there does not exist any Catholic missionary organization for Jews. There is dialogue with Jews; no mission in this

There are other examples that could be cited (many having to do with the interpretations of documents coming from Vatican Council II) but the above will suffice to show that a doctrine or practice in the Catholic Church can be ignored, rejected, or fall into disuse on its own without the Church making any official statement to rescind the doctrine and without any official statement concerning the belief or practice that replaces it. So it is with the Church's traditional teaching on cosmogony and cosmology. They were never officially rescinded, and heliocentrism was never officially taught, but the latter has replaced the former in modern thinking.

"The Church Fathers Did Not Debate Geocentrism"

Some hold to the objection that the doctrine of geocentrism cannot be considered a consenus teaching of the Church Fathers because the Fathers did not openly debate geocentrism, or even accept it as a matter of faith, but merely accepted it without discussion as a fact of nature. The premise here, of course, is that a consensus of the Fathers is not legitimate unless the Fathers argue the issue at hand and explicitly state that the issue is a matter of faith.

The reason this objection is raised stems from the fact that the Council of Trent, along with many other conciliar and papal teachings, declared a belief that was held in unanimous consent by the Church

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proper sense of the word towards them." William Cardinal Keeler and the USCCB, along with prominent Jewish rabbis, co-authored the 2002 document Reflections on Covenant and Mission. One of the more alarming assertions of the document was: "...while the Catholic Church regards the saving act of Christ as central to the process of human salvation for all, it also acknowledges that Jews already dwell in a saving covenant with God….Campaigns that target Jews for conversion to Christianity are no longer theologically acceptable in the Catholic Church." Francis Cardinal George of Chicago added: "...the Church has also sinned against the Jewish people, first of all, in teaching that God's covenant with Israel is no longer valid for them." In 1992, Johannes Cardinal Willebrands wrote the book, *The Church and the Jewish People*, in which he advocated against converting the Jews. John Paul II then appointed Willebrands as President of the Pontifical Council for Promoting Christian Unity. In November 2001, the Pontifical Biblical Commission (PBC), under then Joseph Cardinal Ratzinger, issued a 210-page report titled: "The Jewish People and the Holy Scriptures in the Christian Bible," which, among other things, stated: "…the Jewish messianic wait is not in vain," adding that Jews and Christians share their wait for the Messiah, as Jews are waiting for the first coming and Christians for the second. The PBC profusely apologized to the Jewish people for 'anti-Semitic passages' contained in the New Testament, and also stressed the continuing importance of the Torah for both Jews and Christians.

Fathers requires the belief be held as a definitive teaching of the Catholic Church. In fact, the consensus of the Fathers was the chief argument Cardinal Bellarmine raised against Galileo, as he stated: "Consider now, with your sense of prudence, whether the Church can tolerate giving Scripture a meaning contrary to the Holy Fathers and to all the Greek and Latin commentators." Bellarmine was referring to Trent's decree, stated as follows:

> Furthermore, in order to restrain petulant spirits, It decrees, that no one, relying on his own skill, shall, in matters of faith, and of morals pertaining to the edification of Christian doctrine, wresting the sacred Scripture to his own senses, presume to interpret the said sacred Scripture contrary to that sense which holy mother Church, whose it is to judge of the true sense and interpretation of the holy Scriptures, hath held and doth hold; or even contrary to the unanimous consent of the Fathers...[841]

This teaching was reiterated in the same infallible form by Vatican Council I in 1870:

> But, since the rules which the holy Synod of Trent salutarily decreed concerning the interpretation of Divine Scripture in order to restrain impetuous minds, are wrongly explained by certain men, We, renewing the same decree, declare this to be its intention: that, in matters of faith and morals pertaining to the instruction of Christian Doctrine, that must be considered as the true sense of Sacred Scripture which Holy Mother Church has held and holds, whose office it is to judge concerning the true understanding and interpretation of the Sacred Scriptures; and, for that reason, no one is permitted to interpret Sacred Scripture itself contrary to this sense, or even contrary to the unanimous agreement of the Fathers.[842]

Pope Leo XIII confirmed the words of Cardinal Bellarmine and the Councils in his encyclical *Providentissimus Deus*:

> …the Council of the Vatican, which, in renewing the decree of Trent declares its "mind" to be this – that "in things of faith and morals, belonging to the building up of Christian doctrine, that is to be considered the true sense of Holy Scripture which has been

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[841] Council of Trent, Session IV.

[842] Vatican Council I, Chapter II, Denz. 1788.

> held and is held by our Holy Mother the Church, whose place it is to judge of the true sense and interpretation of the Scriptures; and therefore that it is permitted to no one to interpret Holy Scripture against such sense or also against the unanimous agreement of the Fathers." By this most wise decree the Church by no means prevents or restrains the pursuit of Biblical science, but rather protects it from error, and largely assists its real progress….the Holy Fathers, We say, are of supreme authority, whenever they all interpret in one and the same manner any text of the Bible, as pertaining to the doctrine of faith or morals; for their unanimity clearly evinces that such interpretation has come down from the Apostles as a matter of Catholic faith.

In 1965, Vatican Council II reiterated the Church's teaching on the authority of the Fathers:

> This tradition which comes from the Apostles develop in the Church with the help of the Holy Spirit….The words of the holy fathers witness to the presence of this living tradition, whose wealth is poured into the practice and life of the believing and praying Church.[843] …faithful to the truth which we have received from the apostles and Fathers of the Church, in harmony with the faith which the Catholic Church has always professed.[844]

In light of the present objection, the most relevant point we notice from these official conciliar or papal declarations is that none of them involve definitions or limitations of what constitutes a "unanimous consensus of the Fathers." One would assume that if polemical discussion amongst the Fathers was a critical requirement in order to qualify the consensus as legitimate, and, in turn, critical in requiring our obedience to the consensus, the Church would, indeed, address that issue. To say otherwise is simply an argument from silence. The only matter that was discussed in later Catholic academic settings was the question regarding how many Fathers, and of those how many *prominent* Fathers, were needed for a quorum of patristic witnesses to establish itself as a legitimate consensus. The objection that the Fathers were required to debate an issue amongst themselves before the consensus could be considered legitimate has no precedent and therefore has no merit. The Church simply accepted, regardless of the origin, the consensus of the Fathers as evidence that the

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[843] *Dei Verbum*, Ch. 2, 8.

[844] *Unitatis Redintegratio*, Ch. 3, II, 24.

Fathers were reiterating Apostolic teaching and were thus guided by the Holy Spirit to preserve that original teaching.

That such would be the understanding of a patristic consensus fits well within the manner by which the Fathers often arrived at their conclusions about Catholic doctrine. It was most often the case that the Church would formulate specific doctrines after a common belief or practice of the Church was threatened by internal or external objectors. Beliefs such as the Trinity and the Incarnation were viciously attacked by many groups and individuals; and the Fathers responded by arguing against the perpetrators. In due time, a Council would be called and the matter would be definitively decided, invariably in favor of the consensus of the Fathers.

This process meant, of course, that the customary beliefs of the practicing Church which were not attacked and thus remained as the common conviction of its people were obviously not the results of dialectics or polemics. As such, they remained in their original form. This was especially true of geocentrism, since it was a simply matter of deciding, from very decisive statements in Scripture, whether the Earth moved or did not move. For geocentrism, there were no complicated issues to discuss like those involving the Trinity and the Incarnation, especially considering the primitive stage of the natural sciences at that time. The topic of geocentrism versus heliocentrism was more like the doctrine of the resurrection or ascension of Christ: either Christ rose or he did not rise; either he ascended into heaven or he did not ascend. The variations were limited due to the nature of the subject matter. If, for example, a Father had decided to reject geocentrism, he would automatically have become a heliocentrist, since these were the only two options available in the theological and scientific circles of the day. The only change to these options came in the twentieth century when the concept of acentrism arose from Einstein's theory of Relativity, but even then one must decide, as the Fathers had done long ago, whether the sun revolves around the Earth or the Earth revolves around the sun, since at least one must be true to explain what is observed in the cosmos every day.

Generally speaking, even when the Fathers were in dialectical or polemical discussions on a particular topic, they often did not reach the pinnacle of the Catholic understanding of the doctrine. For example, the Fathers' discussions about the Holy Eucharist were many and varied.[845] All the Fathers believed, based on their literal interpretation of Scripture, during the Mass the bread changed into the body of Christ. This was their unanimous consent and it was supported by various statements in Church teaching made by early popes and councils. But the precise debate as to what actually occurs when the bread is changed into the body of Christ was not much argued amongst the Fathers, for that particular debate would not occur until almost a millennia later when Berengarius (c. 1040), a priest from Tours who was following the doctrine of Ratramnus, had rejected the doctrine. Although Berengarius was condemned by Gregory VII, there was no discussion about how the change to the body of Christ occurred; only that it *did occur* and the faithful were required to accept it. The ultimate understanding of how the Eucharist occurred did not come into being until Thomas Aquinas applied Aristotelian constructs to describe the change, and using the word "transubstantiation," which was here introduced for the first time in history and later confirmed by the Lateran Council in 1215. The point to be made here is, even when the Fathers engaged in a dialectic regarding a particular subject, they did not establish the Church's ultimate understanding of the issue but merely laid the foundation for belief upon which the Church would build and communicate Her actual and official doctrine. Hence, with regard to the issue of geocentrism, even if the Fathers were to argue the issue openly, this does not mean they would have reached a definitive understanding, but only that they would have maintained their consensus based on the clear statements in Scripture that provided the basic belief, both for geocentrism and the bread being changed into the body of Christ.

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[845] See my book, *Not By Bread Alone: The Biblical and Historical Evidence for the Eucharistic Sacrifice* (Queenship Publishing, 2001) for a thorough record of the Fathers' views and debates about the Eucharist.

All that being said, however, there is certainly an element of dialectic and polemics within the patristic era on cosmology and cosmogony. The writings of the Fathers are filled with polemics against the Greeks for believing in what was essentially the prototype to Darwin's evolution and Copernicus' heliocentrism. We covered this dimension of the issue in Chapter 15. For example, we cited the fact that in his work *The Prooemium*, Hippolytus refutes Echphantus' belief in a rotating Earth.[846] This shows us that the Fathers understood Scripture's statements regarding a non-moving Earth to include both a non-rotation as well as a non-translation – the same two non-movements that Galileo sought to nullify. In fact, the documents containing the condemnation of Galileo make reference to the "Pythagorean school" that advocated heliocentrism as the basis for Galileo's reintroduction of the system. By the same token, the Fathers commended the Greek geocentrists, such as Aristotle, although they unanimously rejected the astrology of the Greeks at large. The Fathers were also aware that Babylonian, Egyptian and early Greek thought advanced the idea of a flat Earth, but the Fathers, in consensus, rejected that system for a spherical Earth.

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[846] "And that the earth in the middle of the cosmical system is moved round its own center towards the east." (*The Prooemium*, Ch XIII).

All in all, the Fathers were very aware of the polemical issues concerning cosmogony and cosmology in their day. The major point to be made here is, obviously we have no record of them arguing against each other about these specific issues simply because there was no Father who either contested a motionless Earth or contested that God created the Earth in six miraculous days (except, perhaps, Augustine on the latter issue, preferring a miraculous one-day event than a six-day event, although he accommodated the six days as a real possibility). Scripture was very clear about these two issues and thus there was not much room for disagreement, except for a few minor details. In any case, the patristic consensus on geocentrism was a legitimate consensus. The consensus was based on the fact that Scripture taught the Earth is motionless, and thus the Fathers understood that this very fact of cosmology was a matter of faith upon which to build our understanding of God's creation; and it was the very basis upon which Cardinal Bellarmine, backed by Pope Paul V, employed that consensus against the innovations of Galileo.

Lumen Gentium 12: "The Whole Body…Cannot Err"

Perhaps the most significant reason why the doctrine of geocentrism should be considered infallible comes, quite surprisingly, from one of the more modern declarations concerning the teachings of the Church. Earlier we quoted from *Lumen Gentium 25* to show that Catholics are required to give obedience to both infallible and non-infallible teachings of the Church. Yet *Lumen Gentium* contains an even more significant requirement for obedience in regards to geocentric doctrine, and it certainly seems to make the doctrine infallible. It is stated in Paragraph 12:

> The holy People of God shares also in Christ's prophetic office: it spreads abroad a living witness to him, especially by a life of faith and love and by offering to God a sacrifice of praise, the fruit of lips praising his name (*cf.* Heb. 13:15).[847] The whole body of the faithful who have an anointing that comes from the holy one (*cf.* 1 Jn. 2:20 and 27)[848] cannot err in matters of belief.

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[847] "Through him then let us continually offer up a sacrifice of praise to God, that is, the fruit of lips that acknowledge his name."

[848] "But you have been anointed by the Holy One, and you all know….but the anointing which you received from him abides in you, and you have no need that any one should teach you; as his anointing teaches you about everything, and is true, and is no lie, just as it has taught you, abide in him."

> This characteristic is shown in the supernatural appreciation of the faith (*sensus fidei*)[849] of the whole people, when, "from the bishops to the last of the faithful"[850] they manifest a universal consent in matters of faith and morals. By this appreciation of the faith, aroused and sustained by the Spirit of truth, the People of God, guided by the sacred teaching authority (*magisterium*), and obeying it, receives not the mere word of men, but truly the word of God (*cf.* 1 Th 2:13),[851] the faith once for all delivered to the saints (*cf.* Jude 3).[852] The people unfailingly adheres to this faith, penetrates it more deeply with right judgment, and applies it more fully in daily life.[853]

Since it is a fact that the "People of God," which includes "the bishops to the last of the faithful," have believed unanimously, firmly and without equivocation in the doctrine of geocentrism from the beginning of the Catholic Church and throughout two millennia, and who were "guided by the sacred teaching authority" to do so, this belief necessarily fulfills the criteria of *Lumen Gentium 12* that these same People of God "cannot err." It is an undeniable fact that all the Fathers, all the medievals, all the bishops, priests, saints, doctors, theologians and the remaining Christian faithful of every nation believed in the doctrine of geocentrism. Additionally, three popes and their Holy Offices officially confirmed this absolute consensus in the 17th century against a few men who, because of their own misguided convictions, sought to depart from that consensus, making the attempt in the wake of unproven scientific claims with the express purpose of reinstituting a novel and subjective interpretation of Holy Writ.

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[849] *Lumen Gentium* 12 adds this footnote: "(The *sensus fidei* refers to the instinctive sensitivity and discrimination which the members of the Church possess in matters of faith. – Translator.)"

[850] *Lumen Gentium* 12 adds this footnote: "See St. Augustine, *De Praed. Sanct.* 14, 27: *PL* 44, 980." This refers to Augustine's work *Predestination of the Saints*, Book II, Chapter 14: This grace He placed "in Him in whom we have obtained a lot, being predestinated according to the purpose of Him who worketh all things." And thus as He worketh that we come to Him, so He worketh that we do not depart. Wherefore it was said to Him by the mouth of the prophet, "Let Thy hand be upon the man of Thy right hand, and upon the Son of man whom Thou madest strong for Thyself, and we will not depart from Thee." This certainly is not the first Adam, in whom we departed from Him, but the second Adam, upon whom His hand is placed, so that we do not depart from Him. For Christ altogether with His members is--for the Church's sake, which is His body – the fulness of Him. When, therefore, God's hand is upon Him, that we depart not from God, assuredly God's work reaches to us (for this is God's hand); by which work of God we are caused to be abiding in Christ with God – not, as in Adam, departing from God. For "in Christ we have obtained a lot, being predestinated according to His purpose who worketh all things." This, therefore, is God's hand, not ours, that we depart not from God. That, I say, is His hand who said, "I will put my fear in their hearts, that they depart not from me."

[851] "And we also thank God constantly for this, that when you received the word of God which you heard from us, you accepted it not as the word of men but as what it really is, the word of God, which is at work in you believers."

[852] "Beloved, being very eager to write to you of our common salvation, I found it necessary to write appealing to you to contend for the faith which was once for all delivered to the saints."

[853] *The Documents of Vatican II*, Austin Flannery, O.P., NY: Costello Publishing, 1975, p. 363.

As we have seen, even many years after modern science began to treat heliocentrism as a scientific fact, the Catholic faithful still maintained their vigilance for geocentric doctrine. It has only been in the last one hundred years or so that this consensus has waned.

Because of the waning consensus, some objectors might themselves appeal to the principle of *Lumen Gentium 12* and posit that the Holy Spirit is now teaching the "People of God" that heliocentrism has been correct all along. But that notion, of course, is impossible, since the "People of God" could not have been "aroused and sustained by the Spirit of truth" into believing that geocentrism was correct for 1900 years and then have the Spirit suddenly change His mind to teach them the opposite. It would make the Holy Spirit a liar, which is certainly impossible. The reality is, if the "People of God" were led to believe that geocentrism was the truth, and which was, according to the stipulations of *Lumen Gentium 12*, "guided by the magisterium" to confirm their consensus, then there is simply no possibility that a change in their belief could be understood as a movement of the Holy Spirit.

The Signs of Apostasy

The above facts, sadly enough, leave open only one other possibility for the shift in thinking against geocentrism, yet a shift that is taught and confirmed by Scripture, Tradition and the Magisterium. Quite simply, for the present people of the world to depart from the previous consensus of the "People of God" means that the people have been led astray by false teachings. Is such deception possible on a mass scale? According to Scripture and Tradition, it is not only possible, it is predicted to happen some time before the return of Christ. A worldwide apostasy from the faith predicted by St. Paul in 2 Thessalonians 2:3-12[854] may be the only possible reason why the masses could depart from almost two millennia of consistent personal belief and magisterial decrees, not only concerning the doctrine of geocentrism, but every doctrine that is affected by the same non-literal and "historically critical" hermeneutic foisted on the Church in the last hundred years. As we noted earlier, the new hermeneutic, spawned as it was by insisting that Scripture could be interpreted figuratively where it was once interpreted literally, coupled with the idea that Scripture could err when it addressed non-salvation topics, has totally undermined man's docile belief in Holy Writ in the modern age.

Another possibility is that the current rejection of the Church's original teaching on both cosmogony and cosmology is following the pattern of blindness to which Jesus alerted us in the Gospels. For example, in Jesus' conversation with the Pharisees about divorce, we learn that the practice was common in Israel, so much so that almost all the populace believed that it was one's God-given right to divorce one's spouse. For a long time, the illusion of the freedom to divorce seemed to be a positive societal development permitted by God, even as heliocentrism and evolution presently enjoy the same apparent freedom today. So confident were the people in their lifestyle of divorce that they brought the issue to Jesus even though they already knew He had condemned divorce. They reasoned that they could catch Him denying both the Mosaic law and ultimately God's law which inspired Moses to allow divorce. Jesus, as He always managed to do when He was being tested by hypocrites, turned the tables on them. Little did the divorce advocates realize, until Jesus opened their eyes to the stark reality, that their belief in divorce, which opposed the original decree of God, was given to them not because God discovered a better way for them to manage marital conflicts, but for nothing more than the "hardness of their hearts." In other words, Moses, under God's direction, allowed them to divorce because the people were spiritually destitute. It is a divine principle that is often displayed in Scripture – God turns the rebel over to his own desires as a punishment for his rebellion.[855] Similarly, many today are enjoying the illiusion that they have permission to believe and practice many things that were once condemned, claiming that modern science has enlightened them to a new way of life (contraception, artificial insemination, embryonic stem cell research, cloning, eugenics, abortion, same-sex marriage and child adoption, *etc.*). They believe that society has been enlightened as never before to wonderful inventions and increased knowledge for the benefit of the human race. But in reality, nothing has changed in Scripture, Tradition or the Catholic Magisterium. The inventions and knowledge only make them sin faster than they ever did before. They believe in false notions and engage in immoral practices because they have been deceived by the hardness of their own hearts.[856]

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[854] [3]Let no one deceive you in any way; for that day will not come, unless the rebellion comes first, and the man of lawlessness is revealed, the son of perdition, [4]who opposes and exalts himself against every so-called god or object of worship, so that he takes his seat in the temple of God, proclaiming himself to be God. [5]Do you not remember that when I was still with you I told you this? [6]And you know what is restraining him now so that he may be revealed in his time. [7]For the mystery of lawlessness is already at work; only he who now restrains it will do so until he is out of the way. [8]And then the lawless one will be revealed, and the Lord Jesus will slay him with the breath of his mouth and destroy him by his appearing and his coming. [9]The coming of the lawless one by the activity of Satan will be with all power and with pretended signs and wonders, [10]and with all wicked deception for those who are to perish, because they refused to love the truth and so be saved. [11]Therefore God sends upon them a strong delusion, to make them believe what is false, [12]so that all may be condemned who did not believe the truth but had pleasure in unrighteousness.

These examples, however, are not to say that those who do not believe in geocentrism are either no longer individually faithful to the Catholic Church or that they are an integral part of the apostasy. The masses cannot be blamed for what they have been taught by their authorities. It only means that one of the signs of the general apostasy predicted by Holy Scripture will be a general and pervasive turning away from the previously accepted truths of Scripture and Tradition. The mass rejection of geocentrism is just one sign of that eventuality.

In closing, we will quote the words of Catholic scientist, author, and former professor of the Massachusetts Institute of Technology, Wolfgang Smith:

> Today, four centuries later, what lay concealed in that beginning has become clearly manifest, for all to see; as Arthur Koestler has said, it is "as if a new race had arisen on this planet." Could this be the reason why St. Malachy, in his famous prophesies, has characterized the reign of Pope Paul V (1605-1628) by alluding to the birth of "a perverse race"? One needs to recall that what is sometimes termed the first Galileo trial took place in the year 1616. What, then, could be the "perverse race" to which the saintly prophet refers? Given that Galileo is indeed "the father of modern science," one is compelled to answer that it is none other than the race of modern scientists, and by extension,

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[855] *Cf.*, Nm 11:1-35; Ez 20:25; Rm 1:20-24; 2Th 2:11.

[856] Matthew 19:8: He said to them, "For your hardness of heart Moses allowed you to divorce your wives, but from the beginning it was not so."

the community of individuals imbued with the modern scientistic outlook….

As everyone knows, Galileo was formally tried in 1633 and forced to recant his Copernican convictions. The proposition that the Sun constitutes the immobile center of the universe was declared to be "formally heretical, because it is expressly contrary to the Holy Scriptures." And so the matter stood until 1822, when, under the reign of Pius VII, the Church commenced to soften its stand with regard to what it termed "the general opinion of modern astronomers." Thus began a process of accommodation with "the new race" which came to a head in 1979, when Pope John Paul II charged the Pontifical Academy of Sciences to re-open the Galileo case, and if need be, to reverse the verdict of 1633. Given the mentality which came to the fore in the wake of Vatican II, the outcome of that inquiry was never in doubt: Galileo was exonerated – some would say, "canonized" – following which Pope John Paul II in effect apologized to the world for wrongs committed by the Church. Could this be the reason, perhaps, why St. Malachy alludes to this Pope in the enigmatic words "*De Labore Solis*"? To be sure, the phrase, which traditionally refers to the movement of the Sun, does relate to Galileo, the man who denied that the Sun does move. Could it be, then, that St. Malachy, having previously signaled the birth of a "perverse race," is now alluding to the fact that some four hundred years later the Church has reversed its stand and relinquished its opposition to that "race," which is to say, to that new philosophy? Certainly St. Malachy's allusion can be interpreted in other ways as well; for example, "De Labore Solis" might be taken as a reference to the fact that this Pope, who has traveled far more extensively than any of his predecessors, has so many times "circled the globe" in his papal airliner (named, interestingly enough, "Galileo").

But be that as it may, the fact remains that the Church has now joined the rest of Western society in adopting a scientistic worldview; during the reign of Pope John Paul II, and with his sanction, a Copernican Revolution has finally taken place within the Church itself. Yet, to be precise, it is not the Church as such that has undergone change – that has "evolved," as the expression goes – but what has changed is simply the orientation of its human representatives: it is Rome, let us say, that has reversed its position. Humanly speaking, the ecclesiastic establishment may have opted for the only viable course: given the sophistication and prowess of contemporary science – given the "great signs and wonders" that could deceive even the elect – it may not indeed be feasible to stem the mounting tide of scientistic belief. Nonetheless one must insist, in light of our preceding analysis, that the contemporary cosmology, in any of its forms, is not in fact compatible with Christian doctrine. To the extent, therefore, that Rome has embraced a scientistic outlook, it has compromised the true teaching of the Church: this is the crux of the matter. Call it human failing, call it "political correctness," call it apostasy – the fact is that Rome has become "a house divided against itself."[857]

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[857] Wolfgang Smith, *The Wisdom of Ancient Cosmology: Contemporary Science in Light of Tradition*, Oakton, VA: Foundation for Traditional Studies, 2003, pp. 180-181. Dr. Smith's other works include: *Cosmos and Transcendence* (1984), *Teilhardism and the New Religion* (1988), and *The Quantum Enigma* (1995).

"Human science gains greatly from revelation, for the latter opens out new horizons and makes known sooner other truths of the natural order, and because it opens the true road to investigation and keeps it safe from errors of application and of method. Thus does the lighthouse show many things they otherwise would not see, while it points out the rocks on which the vessel would suffer shipwreck."

Pope St. Pius X[858]

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[858] Pope Pius X, encyclical of March 12, 1904, *Iucunda Sane*, 35.

Let this be recorded for a generation to come, so that a people yet unborn may praise the Lord.

Psalm 102:18

Chapter 17

Interpreting Genesis 1

Its Geocentric Implications

The opening verses of Genesis 1 begin:

First Day

> [1]In the beginning God created the heavens and the earth.
> [2]The earth was without form and void, and darkness was upon the face of the deep; and the Spirit of God was moving over the face of the waters.
> [3]And God said, "Let there be light"; and there was light.
> [4]And God saw that the light was good; and God separated the light from the darkness.
> [5]God called the light Day, and the darkness he called Night. And there was evening and there was morning, one day.

Second Day

> [6]And God said, "Let there be a firmament in the midst of the waters, and let it separate the waters from the waters."
> [7]And God made the firmament and separated the waters which were under the firmament from the waters which were above the firmament. And it was so.
> [8]And God called the firmament Heaven. And there was evening and there was morning, a second day.

Third Day

> [9]And God said, "Let the waters under the heavens be gathered together into one place, and let the dry land appear." And it was so.

> [10]God called the dry land Earth, and the waters that were gathered together he called Seas. And God saw that it was good.
> [11]And God said, "Let the earth put forth vegetation, plants yielding seed, and fruit trees bearing fruit in which is their seed, each according to its kind, upon the earth." And it was so.
> [12]The earth brought forth vegetation, plants yielding seed according to their own kinds, and trees bearing fruit in which is their seed, each according to its kind. And God saw that it was good.
> [13]And there was evening and there was morning, a third day.

Fourth Day

> [14]And God said, "Let there be lights in the firmament of the heavens to separate the day from the night; and let them be for signs and for seasons and for days and years,
> [15]and let them be lights in the firmament of the heavens to give light upon the earth." And it was so.
> [16]And God made the two great lights, the greater light to rule the day, and the lesser light to rule the night; he made the stars also.
> [17]And God set them in the firmament of the heavens to give light upon the earth,
> [18]to rule over the day and over the night, and to separate the light from the darkness. And God saw that it was good.
> [19]And there was evening and there was morning, a fourth day.

These opening verses of Scripture are probably the most important in the book of Genesis, if not the entire Old Testament, yet they are seen as the most difficult to interpret and often fall victim to misunderstanding and exegetical abuse. One reason for the difficulty is that the exegete, if he is prepared to interpret the verses as literally as his traditional hermeneutics leads him to interpret other passages of Holy Writ, must be willing to:

- accept that the Earth was created first; three days before the sun, moon and stars which do not appear until the Fourth Day;
- accept that the light created on the First Day is prior to and independent of the light radiating from the sun and stars on the Fourth Day;
- accept the creation of an expansive firmament on the Second Day that rests in outer space and upon which water rests.

Unlike many today, the Fathers of the Church found such concepts relatively easy to accept. At the same time, they also found it easy to reject the evolutionary and Big-Bang-like concepts that were prevalent in the Greek culture. As the early third-century Father, Hippolytus put it:

> But Leucippus, an associate of Zeno...affirms things to be infinite, and always in motion, and that generation and change exist continuously.... And he asserts that worlds are produced when many bodies are congregated and flow together from the surrounding space to a common point, so that by mutual contact they made substances of the same figure and similar in form come into connection; and when thus intertwined, there are transmutations into other bodies, and that created things wax and wane through necessity..."[859]

But since today modern society is 1,500 or so years removed from the Fathers of the Church and believe they have progressed way beyond them in scientific knowledge, these biblical passages are, indeed, difficult for many people to accept on a literal basis. There seems to be little in modern science with which to coincide them. No one has ever seen a "firmament" with water resting on its surface. Rather, like Leucippus, modern science insists that the universe came into being with a "Big Bang" which originated from a cosmological "singularity," some of which, over billions of years, finally coalesced into objects such as our Earth. For people to accept, as Genesis 1 apparently teaches, that the Earth appeared first before anything resembling a Big Bang ever occurred, goes against just about everything modern man has been conditioned to believe about the cosmos. But there the words unabashedly and unforgivingly remain in Holy Writ, written by a Supreme Being who cannot lie. Whether they like it or not, the opening words of the Bible require the reader to make a crucial decision from the get-go as to what interpretive methodology he will adopt. Fortunately or unfortunately, the decision he makes will affect everything else he reads within and subsequent to Genesis 1 in the most profound way.

Today there are a number of Christian cosmologists who see little problem accepting the Big Bang and Einstein's Relativity theories, despite the inordinate anomalies discovered in them almost daily. These Christian cosmologists believe that the universe is billions of years old, although they cautiously add that it could only have developed into the complexity we see today by an intermittent divine intervention. They call themselves "Progressive Creationists" and "Theistic Evolutionists," although the latter believe that God intervened only once, at the beginning of time.

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[859] *The Refutation of All Heresies*, Ch. X.

There are other Christian scientists who, although they accept Relativity, reject the Big Bang. Most of these scientists are connected with the *Creation Research Institute* (CRI) and *AnswersinGenesis* (AIG) with such names as the late Henry Morris, Duane Gish, Russell Humphreys, Donald DeYoung, and Ken Ham as their main spokesmen, respectively. Most of these scientists adhere to a strict biblical science, accepting the fact that the Genesis narratives compel them to believe in a precise six 24-hour day creation week, as well as a non-gap interpretation of the genealogies of Genesis chapters 5, 10 and 11. This interpretative methodology results in a time period of approximately 6,000 years to the present day for the universe to have been in existence since Creation. In addition, although there are a few private geocentrists among them, the official policy of *Creation Research Institute* and *AnwersinGenesis* and their affiliates is a Relativistic, Copernican universe.

For the reasons already outlined, this book, *Galileo Was Wrong: The Church Was Right*, has shown the foundational flaws in Relativistic cosmology. Although organizations such as the *CRI* and *AIG* are to be applauded for their adherence to a literal interpretation of Genesis 1:20-31 with regard to how animal species and man came into existence, by the same token they systematically avoid the same exegetical rigor in their respective interpretations of the non-biological items in Genesis 1:1-19. Russell Humphreys, for example, although he admits that

> Genesis 1:1-2 declares the uniqueness and centrality of our home planet, and mentions the Earth first...long before it mentions the Sun, Moon and stars over a dozen verses later, on the fourth day,

regresses from the obvious implications of this strong language since, due to his siding with various preferences of modern science, he subsequently removes Earth from the center and replaces it with the Milky Way galaxy. In other words, Humphreys' view is galactocentric, not geocentric. This, coupled with his institution's failure to offer a convincing critique of geocentrism,[860] leaves Humphreys' galactocentric view as a non-literal reading of Genesis 1:1-19 that is opposite his literal reading of Genesis 1:20-31.[861] As Walter van der Kamp observed:

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[860] *E.g.*, astronomer D. R. Faulkner's effort in "Geocentrism and Creation" in *Ex Nihilo Technical Journal* 15 (2):110-121, 2001, which attempted to refute Gerardus Bouw's book *Geocentricity*, and which was in turn rebutted by Bouw in "The Copernican Revolution: A Fable for Educated Men," *Biblical Astronomer* technical paper, No. 2, 2002, pp. 1-16, with no return rebuttal by Faulkner. See my rebuttal of Faulkner at www.galileowaswrong.com

> I still have to find one all-out creationist who takes Genesis 1:1-19, minus the verses 11, 12 and 13, just as straight-forwardly as Genesis 1:20-31. But sauce for the goose is sauce for the gander: he who accepts instantaneous *fiat* creation of our planet's flora and fauna has with regard to cosmogony thereby committed himself to a beginning of a Heaven containing nothing but a primeval Earth…. Popularly formulated: a Bible-believing Christian cosmogony must reject a Big Bang now having resulted in countless suns…. Contrariwise it has to postulate sudden emergence of, to quote Hoyle, 'the bubble in which we live,' and a dump of matter without form providing after five days of formation the dust out of which we are fashioned…. Just postulate not an 'etherosphere' embracing Mother Earth, but a 'galactosphere' encompassing the stars. Then you will have come close to enthroning Tycho Brahe![862]

And again:

> In the same manner, but with even less solid observations to build on, astrophysicists discuss in their diagrams the life cycles of stars, their composition, and their distance from us. Why then do creationists soundly reject Darwin, but still kowtow to Copernicus? No man should serve two masters, should he? I have as yet not been able to find one orthodox theologian willing to give me a serious hearing…. I have come to realize how it had to be expected…. Small wonder that these theologians assume the article of modern scientific faith to have the same kind of infallibility, which they take for granted in their own deductions from Holy Writ. People for whom the Bible is no more than a quaint old book, and who therefore have no interest in saving it at the cost of scientific knowledge, gladly admit that the Scriptures proclaim the pre-eminence of man in an Earth-centered universe. To doubt or to deny it, they will affirm, is to

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[861] Another advocate of a galactocentric universe is Robert V. Gentry, famous for his work in Polonium haloes and reinterpretation of red shift. Gentry's view, however, while similar to Humphrey's, is highly influenced by the Seventh Day Adventist belief which holds that God resides at the center of the universe, but apart from Earth.

[862] *De Labore Solis*, pp. 54, 39.

> wrench the meaning of the Genesis text…. Anyway: caught between a hard rock and an immovable place the defenders of the Infallible Word do with regard to Genesis 1:1-19 not shilly-shally: the literalness of that pericope is the loser. But the thing that baffles me to no end is that in relation to Genesis 1:11-13 and 20-31 the creationists among these theologians defend tooth and nail its literalness. Why this measuring by two standards?[863]

Van der Kamp's words are logically sound. Obviously, it is hardly inspiring to watch Bible Christians display to the world how faithful they are to the literal interpretation of the divine word if they end up rejecting that very literalness when confronted with Scripture (Genesis 1:1-19) that rubs against one of the more popular but unproven theories of modern science – Copernicanism. Although CRI's and AIG's decision to downplay geocentrism is based, in part, on a desire not to foment undue criticism from the secular world as they valiantly defend Creationism against the theory of evolution, still, any astute critic can see the intellectual hypocrisy in that defense, since the literal interpretation of Genesis 1-2 should be an all-or-nothing proposition for the faithful exegete of Holy Writ. The exegete, once he commits himself to a literal interpretation, cannot, without explicit directives from the text itself, arbitrarily decide when he can depart from that interpretative philosophy, especially since the non-biological sections of Genesis 1, which describe the making of a geocentric universe, take up 50% of the six days of creation (Days 1, 2 and 4).

Protestant Interpretations of Genesis 1

Dr. Hugh Ross

Although there are many Bible Christians today who have sought to establish a scientific cosmology and cosmogony based on the opening words of Genesis, they invariably distort these same Scripture passages due to the scientific presuppositions they bring to it. Scripture does not teach heliocentrism, relativity, or evolution, yet various modern Christian exegetes invariably force these unproven beliefs into the words of Holy Scripture. One advocate and prolific spokesman for such modern exegesis is Hugh Ross.[864] Although Ross is more consistent to his own principles of biblical exegesis than someone like Russell Humphreys, this often leads him to even more erroneous interpretations, since Ross is more confined by his hermeneutic to meld atheistic science's beliefs into the theism of Scripture.

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[863] *De Labore Solis*, pp. 107-108.

[864] Some of Ross' works include: *The Fingerprint of God: Recent Scientific Discoveries Reveal the Unmistakable Identity of the Creator*, California: Promise Publishing Co., 1989, 1991; *Creation and Time: A Biblical and Scientific*

For example, in Ross' view, the battle for cosmogony today is limited to the Big Bang versus the Steady-State theories. Since the Big Bang offers Ross a "beginning" to time, whereas the Steady-State model holds there is neither a beginning nor an end to the universe, logically, with only these two options at his disposal Ross feels compelled to defend the Big Bang, and consequently he interprets Genesis 1-2 exclusively from that single scientific perspective. Consequently, as we will see, he ends up with a significant number of forced interpretations.

Ross begins by affirming his belief in Copernican cosmology. As he sees it:

> Arguably the most famous example of misapplication of the scientific method was the Roman Catholic Church's rejection of Galileo's heliocentric (sun-centered) theory of the solar system.[865]

Perspective on the Creation-Date Controversy, Colorado: NavPress, 1994; *Beyond the Cosmos: What Recent Discoveries in Astronomy and Physics Reveal about the Nature of God*, Colorado: NavPress, 1996; *The Creator and the Cosmos: How the Greatest Scientific Discoveries of the Century Reveal God*, Colorado: NavPress, 1993; *The Genesis Question: Scientific Advances and the Accuracy of Genesis*, Colorado: NavPress, 1998.

[865] *The Genesis Question: Scientific Advances and the Accuracy of Genesis*, Colorado: NavPress, 1998, p. 189. In another place Ross primes his reader to consider an Earth-centered cosmos as an example of "Bible Illiteracy," following with: "…I have heard professors assert before scholarly audiences that the Bible teaches a flat Earth geocentrism (placing the Earth at the center of our solar system or the universe)…" (*ibid.*, p. 15). Ross' subtle yet deliberate attempt to bond "flat Earth" advocates and geocentrism (even though he conveniently blames it on "professors") is typical of the scientific demagoguery he uses in most of his books to persuade people to his Big Bang/Relativistic viewpoint. With just a little open-minded study, Ross could have learned quite quickly that the Fathers of the Catholic Church all believed in a spherical Earth, even though they were all firm believers in geocentrism. As even Stephen Gould admitted: "There never was a period of 'flat Earth darkness' among scholars (regardless of how many uneducated people may have thus conceptualized out Earth both then and now). Greek knowledge of sphericity was never lost, and all major medieval scholars accepted the Earth's roundness as an established fact of cosmology" ("The Persistently Flat Earth," *Natural History*, March 1994, p. 14). Similarly, Jeffrey Russell, in *Inventing the Flat Earth*, Praeger Paperback, 1997, reveals that neither

Ross has a somewhat freewheeling interpretive methodology that, although claiming to be faithful to the text, in actuality exhibits a faithfulness that is defined by Ross' commitment to the Big Bang theory, not a commitment to a thoroughgoing literal interpretation of Genesis. This foundation in his thinking comes from Ross' own words:

> By the time I turned sixteen, I had studied enough cosmology to become convinced that of all the origins models ever proposed, the big-bang model best fit the observational data. Soon after my sixteenth birthday, the implications of that model began to dawn on me. Without consciously doing so, I took a huge philosophical and spiritual step…. I understood that the big-bang meant an expanding, "exploding" universe. I agreed with Einstein that an exploding universe can be traced back to an explosion, a beginning. If the universe had a beginning, it must have a Beginner. The big-bang theory implied that a Creator exists.[866]

In one sense, Ross is correct, since the idea of a "beginning" is the very reason that Stephen Hawking has recently distanced himself from the Big-Bang theory[867] (and which, we suspect, a lot more secular scientists will do in the coming years, especially since the flaws in Big Bang cosmology are almost appearing daily in the scientific journals and secular newspapers). Still, Ross remains a die-hard advocate of the Big Bang, more or less denouncing anyone who rejects the theory as scientifically and biblically illiterate. We submit, however, that Ross' interpretation of Genesis consistently attempts to foster a meaning and motivation on the text that is totally foreign to what is plainly stated by its inspired words. For example, Ross writes:

> Scientifically, the movement of the sun across the sky could be the result of the sun moving relative to the Earth or the Earth relative to the sun. Biblically, the "foundations of the Earth" indeed are "immovable" in spite of any revolution of the Earth about the sun or rotation of the Earth about its axis because the

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Christopher Columbus nor his contemporaries thought the Earth was flat. Unfortunately, since the late 1800s this falsehood is perpetuated in academia and in the media today in order to create the perception that the medieval period was scientifically illiterate.

[866] *The Genesis Question: Scientific Advances and the Accuracy of Genesis*, pp. 10-11.

[867] *A Brief History of Time*, p. 100ff.

> Bible verses making such statements always are from the perspective, or point of view, of an observer on the surface of the Earth.[868]

The operative word in Ross' analysis is "relative." Having already accepted Einstein's Relativity as the foundation from which to view the world, it is easy for Ross to appear "scientific" as he fosters the idea that biblical language can mean either the Earth moves relative to the sun or vice-versa. To Ross there is no contradiction in such opposite propositions, since he has already made the Big Bang and Relativity the foundation upon which he stands, and he does his best to convince the reader that the biblical language allows this kind of interpretation. In fact, to support his thesis, Ross delves deeply into the Hebrew text seeking to discover its original meaning, but unfortunately his conclusions are always shaded by what he has already convinced himself is the only possible answer. For all his lexical analysis of Hebrew words, one of the main things Ross fails to see is that the Hebrews who wrote Genesis 1 did not assign the meanings to its words that Ross so desperately wants to attach to them. The writers of the Hebrew text, as is well known among biblical scholars and historians, understood the Hebrew words of Genesis to be teaching an Earth-centered cosmos that was created in six literal days, since that is obviously the plain meaning of the Hebrew words. They did not speak of "relative" perspectives or "points of view," since to them nothing was relative and there was only one point of view – the correct one. Ross attempts to sprinkle his analysis with qualifications and disclaimers that attempt to convince the reader that the Bible

> …stands apart, and dramatically so. From the first page I could see distinctions. The quantity and detail of the scientific context far exceeded what I found in the other books. To my surprise, the scientific method was as clearly evident in Genesis 1 as it is in modern research…. I calculated the odds that the writer could have guessed the initial conditions and correctly sequenced the events…and I discovered that the odds are utterly remote…[869]

But in the end, it appears that what Ross respects more is his self-attested ability to mold the Genesis text into his own scientific presuppositions, and then he congratulates himself by asking the reader to marvel at what an accurate piece of literature Genesis turns out to be. Although his enthusiasm for the biblical text certainly shines through, it is an enthusiasm that actually gets in the way of the biblical text rather than explicating it more clearly. In brief, Ross simply makes an eisegesis out of the text from what his scientific presuppositions desire to see.

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[868] *The Genesis Question: Scientific Advances and the Accuracy of Genesis*, p. 189.

[869] *The Genesis Question: Scientific Advances and the Accuracy of Genesis*, 1998, pp. 11-12.

Case in point: Since he is aware that Genesis 1 specifies the existence of the Earth on the First Day of Creation but reserves the appearance of the sun and stars to the Fourth Day, Ross needs some exegetical basis for positing that the Big Bang occurred before the appearance of the Earth. Although Ross does not succumb to the temptation common among other biblical enthusiasts (*e.g.*, those who claim that the clause "And God said, Let there be light" refers to the Big Bang, which causes an obvious conflict with the fact that the Earth was in existence before the "light" was called into being),[870] Ross decides that the opening sentence of Genesis 1:1 will suffice for the task. He writes:

> *Hashamayim we ha'erets* ("heavens" plural and "Earth" singular with the definite articles and the conjunction) carries a distinct meaning, just as the English words "under" and "statement" or "dragon" and "fly" put together as compound nouns take on specific meanings. *Hashamayim we ha'erets* consistently refers to the totality of the physical universe: all of the matter and energy and whatever else it contains. All of the stars, galaxies, planets, dust, gas, fundamental particles, background radiation, black holes, physical space-time dimensions, and voids of the universe – however mysterious to the ancient writer – would be included in this term.[871]

So that we don't falsely accuse Ross, we need to see his further development of this particular interpretation before we comment. Two paragraphs later he explains even more clearly his intention:

> New scientific support for a hot big-bang creation event, for the validity of the space-time theorem of general relativity, and for ten-dimensional string theory verifies the Bible's claim for a beginning. In the final decade of the twentieth century,

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[870] As proposed, by Professor Dermott Mullan, astrophysicist at the University of Delaware, (letters on file).

[871] *The Genesis Question: Scientific Advances and the Accuracy of Genesis*, 1998, p. 20.

> astronomers and physicists have established that all of the matter and energy in the universe, and all of the space-time dimensions within which the matter and energy are distributed, had a beginning in finite time, just as the Bible declares.[872]

In other words, Ross has firmly sealed in his mind that two theories, Relativity and String Theory, have been proven beyond much doubt, and thus, as he puts it, this evidence "verifies the Bible's claim for a beginning." Ross is so enthused that these modern cosmologies start with a "beginning" that it doesn't really matter to him just what *kind* of beginning the two theories propose, or even if the beginning of one is different than the beginning of the other. In an ironic sort of way, Ross reverses the common cliché "the end justifies the means" to "the beginning justifies the end."

Let's examine his claims a little closer. In regard to Gn 1:1, biblical exegetes normally haggle over whether the opening sentence ("In the beginning God created the heavens and the Earth") is merely an introductory statement of all that follows in vrs. 2-31, or an actual statement of fact that the heavens and the Earth were created prior to the objects created in vrs. 2-31. The closer to Ross' view is the latter. Ross depends on this interpretation, obviously, since he must have the Big Bang placed chronologically prior to anything else in the narrative. But this presents a serious problem for Ross. By claiming that the clause "God created the heavens" refers to "All of the stars, galaxies, planets…" this means that the Genesis writer's detailed description of the creation of the stars and sun on the Fourth Day (Gn 1:14-19) is either superfluous or does not refer to an actual creation of the stars and sun. More specifically, it means that as the Genesis writer specifies these heavenly bodies were "created" on the Fourth Day, not the First Day, Ross insists that this information simply cannot be interpreted literally. Ross must then change the normal denotation of the Hebrew words to mean something other than a creation of the sun and stars.

As an aside, Ross' type of interpretive methodology could lead to the proposition that even the remaining Days of Genesis 1 do not require a literal interpretation (although Ross is not guilty of this himself). For example, one could argue, based on Ross' line of reasoning, that since the Fourth Day is not an act of creation, then the firmament was not created on the Second Day; the plants were not created on the Third Day; and the birds, fish, animals and man were not created on the Fifth and Sixth Days, respectively. In fact, there would be little to stop someone from concluding that there is anything in the narrative we can take at face value.

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[872] *Ibid.*, p. 21.

Ross, however, wants to be a bit more discriminating concerning the things he applies to the "heavens and the Earth" since, although he asserted that "the heavens" includes all the "matter and energy" in the universe, he did not say that it included the plants, fish, fowl, animals and man. Perhaps Ross sees "the heavens" as completely stocked with its essential ingredients on the First Day but the Earth has, as yet, to be furbished. But this also presents a problem, since Gn 1:1 suggests no such imbalance in the constitution of heaven and Earth. Based on its simple wording, Ross cannot claim that the heavens are complete but the Earth is incomplete; not, at least, without imposing his personal view on the text.[873]

The problems continue to mount for Ross. Once he commits himself to what he believes is a literal interpretation of the words of Gn 1:1, then, to be exegetically fair with the text, he should interpret Gn 1:2-31 in exactly the same fashion. Unfortunately, he cannot do so because he has already presupposed that the sun and stars were created on the First Day as opposed to the Fourth Day.

Accordingly, now is the crucial point in whether Ross' whole approach to melding Scripture and modern cosmology will survive. This is precisely why Ross covers this particular subject (the creation of the sun and stars) in the opening pages of his book, for without a satisfactory solution to the apparent contradiction between the First Day and the Fourth Day, he knows he will be building on sand. In fact, if Ross cannot provide a convincing answer, then every book that he has written on this subject is virtually worthless, since they are all based on the same premise. So does Ross have a solution? Well, he has what he believes is the clinching argument. Titled: "A Crucial Shift," Ross explains his exegetical rationale in the next paragraph:

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[873] References to the creation of the "heaven and Earth" appear many times in the Old Testament, but in each case there is no stipulation that the heavens contained their complete adornment prior to the Earth's, or that Genesis 1:1 suggests some type of chronological priority for the heavens over the Earth. Rather, the heavens, as well as the Earth, await their material constitution in the remaining six days (*cf.*, Ex 20:11; 31:17). In fact, the heavens and the Earth are often addressed separately from the material bodies subsequently added to them (*e.g.*, Ps 146:6 [145:6]; Ac 4:24; 14:15; Cl 1:16; Ap 10:6; 14:7). There is never a reference in Scripture to the heavens being created first and the Earth second (*cf.* 2Kg 19:15; 2Ch 2:12; Ps 121:2 [120:2]; 124:8 [123:8]; 134:3 [133:3]; Is 37:16). The heavens and the Earth are said to pass away at the same time (Mt 5:18; 24:35; 2Pt 3:10). The heavens may also refer to the angels and their abode, as is suggested by such passages as Dt 30:19; 31:28; Ps 69:34 [68:35]; 115:15 [113:15]; Ap 12:12).

> The frame of reference, or point of view, for the creation account suddenly shifts in Genesis 1:2, from the heavenlies that make up the entire physical universe to the surface of planet Earth. For whatever reasons, perhaps because it comes so abruptly, most readers – even scholarly commentators – miss the shift. I am convinced that my absorption in science prepared me to see it. In fact, I was struck with amazement that this ancient document actually is structured like a modern research report…. In each case the passage identifies the reference frame (or viewpoint) from which events are described, the initial conditions, a chronology, a statement of final conditions, and some conclusions about what transpired.[874]

Thus, in Ross' interpretation of the text, the Genesis narrator is said to be following the "scientific method" such that he establishes the correct interpretive scheme by making a specific statement regarding the all-important "reference frame" from which he speaks. But is Gn 1:1 really a "reference frame," or is it just a plain statement about certain actions that occur? If both the "heavens" and the "Earth" are mentioned, then there is no attempt to impose a specific "reference frame" on the text, since what is being created are two viewpoints, one from heaven and one from Earth, not merely the heavens. If the passage had said something similar to the following: "In the beginning God created the heavens, *and then* he created the Earth," or "In the beginning God created the heavens, and after that was completed he created the Earth" Ross might have an argument since the text would be clear that the heavens were created first and thus would serve as the primary reference frame. But the text of Gn 1:1 insists otherwise. This is evident by the fact that Gn 1:2 continues its description of events based on the fact that the Earth now exists, and thus we are then given more information as to its condition such that the narrator adds the appropriate contiguous wording: "and the Earth was without form and void, and darkness was upon the face of the deep." Consequently, there is no particular "reference frame," and thus there is no "crucial shift" between Gn 1:1 and 1:2. If anything, there is a flow of thought since the waw-disjunctive of the original Hebrew ("and") that begins Gn 1:2 makes the continuity clear.[875]

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[874] *The Genesis Question: Scientific Advances and the Accuracy of Genesis*, 1998, p. 21.

[875] Gn 1:2 begins with the Hebrew *waw*-disjunctive or what is also known as a *waw*-explicative (והארץ), wherein a *waw* is placed before a noun, as opposed to a

We must also point out that if the text announces in Gn 1:1 that the Earth was created, yet insists in the remaining account that it needs to be furbished because it was initially made “without form and void and darkness on the face of the deep,” then it only makes sense that “the heavens” have neither been created as yet nor have received the accessories that will make its abode functional. Needless to say, on the very same Day, the First Day, God says, “Let there be light” (Gn 1:3). This is not a light that is generated by the Earth, and thus it must have its origin somewhere above the Earth’s surface, in order for it to provide the “evening-morning” sequence stipulated at the end of Day One (“and there was evening and morning day one”). Likewise, on the Second Day, God creates the firmament, a mysterious substance that has the ability to divide and form a barrier between massive amounts of water. Although some of this water remains on Earth, the remainder, according to the text, is sent to a place above the firmament or heavens (Gn 1:6-9). That the firmament is the ornamentation of the heavens, not the Earth, is noted by the fact that Gn 1:8 says, “God called the firmament the heavens.”[876] The final furbishing of “the heavens” comes on the Fourth Day, wherein the sun, moon, and stars are created. All in all, the account is seamless. After the heavens and the Earth are created, both are still missing their most vital parts, that is, the parts that will make them functional and which will cause the heavens and the Earth to cooperate with one another and share each other’s commodities. Thus, whatever “scientific” paradigm Genesis 1 is following, it is certainly one that neither creates preferred “reference frames” nor makes dramatic shifts in its historical account.

Consequently, Ross’ thesis does not hold. Gn 1:1 does not, in any sense, describe a primordial explosion commonly dubbed “the Big Bang.” If read in its plain sense, there is, indeed, a primordial birth, but it is the Earth which awaits its adornment scheduled for the remaining hours of the

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waw-consecutive which places the *waw* before a verb. The *waw*-disjunctive of Gn 1:2 represents a continuation of thought from Gn 1:1, not a change in scene or perspective. As such Gn 1:1 is a titular or introductory statement for the chapter, consequently leaving the earth independent of the heavens until the heavens are introduced in Gn 1:8 under the title “firmament” that is created on the Second Day (Gn 1:6-7). The *waw*-disjunctive thus makes vrs. 1-5 describe the earth existing by itself for a whole day, and subsequently have the heavens come into being in vrs. 6-9 on the Second Day. Interestingly enough, Scripture never refers to the Earth as being “in the heavens,” but always independent of the heavens.

[876] The Hebrew uses the plural שׁמים (“the heavens”) in Gn 1:8, the same as it does in Gn 1:1.

First Day, and the subsequent fixtures added from the Second through the Sixth Days.[877]

Once again, if one is going to commit himself to a literal interpretation of Genesis 1, he must acknowledge that the Earth was created before the other heavenly bodies, *e.g.*, the sun and stars. That being the case, the Genesis writer gives us an Earth-centered cosmos around which all the other celestial bodies will be situated. Scientifically speaking, it only makes sense that the Earth cannot be revolving around a sun or have its day/night sequence caused by a sun that will not yet exist for three days. According to the text, the only entity moving is the Spirit (who is hovering over the waters), not an Earth in rotation. In the midst of the Spirit's movement the light is created, which, because of light's nature, also moves, and the Spirit is thus directing the light and causing the day/night sequence.

Suffice it to say, since Ross has committed himself to the stipulation that the celestial functions were already in progress in the opening moments of the First Day, this leads him to give a somewhat pedantic list of scientific processes that must be strung together in order to provide his reader with some semblance of logic to his already convoluted exegesis of Genesis 1. At one point Ross is hypothesizing about an atmosphere so thick around the Earth that light becomes impenetrable, which suddenly disappears because "a body at least the size of Mars…possibly twice as large, made a nearly head-on hit and was absorbed, for the most part, into Earth's core."[878] Indeed, these kinds of wild concoctions and unproven theories permeate Ross' books. One's head is swimming with speculation after speculation in Ross' account of what may, or must, have happened in the past in order to account for how everything should fit together in the present.

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[877] What is also neutralized by Ross' failure to support his foundational interpretation of Gn 1:1 is his attempt to support theistic evolution or progressive creationism since, if there is no break between the creation of "the heavens" and "the Earth," then there is no time for a development of the cosmos on an evolutionary time scale. Moreover, without a cosmic evolutionary time-scale, there cannot be a geologic evolutionary time scale, since one depends on the other.

[878] *The Genesis Question: Scientific Advances and the Accuracy of Genesis*, 1998, p. 32. In his other books, Ross assumes as proven many scientific theories that are still in dispute. For example, Ross claims: "Despite the obsession of many scientists – and even some theologians – to avoid the dramatic conclusion of an expanding universe, no substitute explanation has ever been put forward to account for the red shifts of distant galaxies. All tentatively proposed alternatives have been easily struck down" (*The Fingerprint of God*, pp. 82-83). Either Ross has been selective in his reading of the redshift controversy, or the modern science establishment has led him to believe that alternatives to equating redshift to distance and speed have been "easily struck down." According to the literature, the only way the alternatives have been dismissed is by suppression of the evidence. Scores of books have been written on this issue, and at the least, Ross

For economy of space we will analyze just one of the Days for which Ross provides a subsequent interpretation – the Fourth Day. Ross writes:

> "On Creation Day Four, the sun, the moon, and the stars became distinctly visible from Earth's surface for the first time."

Immediately we see the twisting of the text that is going to pervade Ross' interpretation in order to make his Big Bang theory fit. We now see that in order to compensate for his confinement of "all the stars, galaxies, planets, dust, gas" to the opening line of Genesis 1, Ross must now turn what has been traditionally understood as the actual *creation* of the sun and stars on the Fourth Day (and what the Hebrew writer himself believed) into a mere *unveiling* of what Ross says are already-present celestial bodies. According to Ross, these celestial bodies become visible on the Fourth Day because of the removal of a dense cloud that was already present due to the primordial condition of the Earth. Apparently, even though the above-described collision with the Mars-like planet cleared some of the dense atmosphere from the Earth, according to Ross it did not remove enough to allow an Earth-based observer to see the disc of the sun

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should have the intellectual honesty to alert his reader to these sources, especially since his book, *The Fingerprint of God*, is a voluminously annotated work. Perhaps the reason Ross has chosen not to reveal these sources is that they come from opponents to his cherished Big Bang theory, *e.g.*, Halton Arp's *Quasars, Redshifts and Controversies*, 1987; *Seeing Red: Redshifts, Cosmology and Academic Science*, 1998; Eric Lerner's *The Big Bang Never Happened*, 1992; Tom Van Flandern's *Dark Matter, Missing Planets and New Comets*, 1993; just to name a few of modern science's opponents to the popular "redshift equals distance" theory. Edwin Hubble himself doubted whether redshift could be used to measure distance, and his partner M. L. Humason had denied it outright. Opposition to alternative explanations to redshift were advertised no better than when Arp (a protégé of Edwin Hubble), after documenting hundreds of pages of controverting evidence, was suddenly denied telescope time at the major observatories in the United States (forcing Arp to go to Germany to continue his studies). Fred Hoyle, who supported Arp, also had his own persecutions. In one instance, Arp recalls dining at Hoyle's university and his mention of Hoyle's name at the dinner table. One of the diner's stated: "He is a great scientist who was treated very badly round here." Arp adds that he could never forget "the fearful whisper in which it was spoken, as if we were in some kind of occupied territory" (Halton Arp, *Quasars, Redshifts and Controversies*, p. 170).

or the twinkle of the stars (although Ross conveniently adds that there was at least enough filtered sunlight to allow the process of photosynthesis for the plants created on the Third Day).[879] Of course, all of Ross' hypothesizing is predicated on his insistence that the account is written from an "Earthly frame of reference," yet he fails to reconcile this hypothesis with the fact that there is yet no one on Earth to view the sun and stars as they peek their way through the clouds. That, of course, will not occur until the Fifth or Sixth day.

Aware of the fact that he cannot just assert that the sun and stars are merely *unveiled* rather than *created* on the Fourth Day, Ross tries his hand at Hebrew etymology and verb parsing in order to convince the reader that although one sees the word "create" or "made" in his English Bible, it doesn't really mean what it says. Ross explains:

> The Hebrew verb '*asa*, translated "made," appears in the appropriate form for completed action. (There are no verb tenses in the Hebrew language to parallel verb tenses in English, but three Hebrew verb forms are used to denote action already completed, action not yet completed, and commands.) Verse 16 does not specify when in the past the sun, moon, and stars were made. However, the wording of verses 17 and 18 does provide a hint: "God set them in the expanse of the sky to give light on the Earth, to govern the day and the night, and to separate light from darkness." Notice the echo of wording from Day One (verses 3-5). This verse tells us *why* God created the sun, moon, and stars and suggests that the sun was in place to fulfill its role on the first creation day. The *syamayim wa'eres* (heavens and Earth) in verse 1 places the making of the sun and the stars before the first day of creation. The moon, however, could possibly have been made during the first creation day.[880]

So, according to Ross, despite the fact that Gn 1:14-19 presents itself as one specific day in the sequence of consecutive days during which God is creating new objects to place in the heavens and the Earth, Ross insists that this particular pericope is written only to tell us "*why* God created the sun and stars" but not, as he does with the other Days, to tell us that God *actually created* the sun and stars on this particular day. That Gn 1:14-19 is the only such Day to which Ross attributes such anachronism doesn't seem to bother him, even though the Genesis writer gives us absolutely no indication that such anachronistic wording is intended.

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[879] *Ibid*., p. 39.

[880] *The Genesis Question: Scientific Advances and the Accuracy of Genesis*, 1998, pp. 44-45.

Ross' appeal either to the verb "*asa*" or to some idiosyncrasy in "Hebrew verb forms" is a form of argument that is simply incapable of proving anything so grand as the claim that these celestial bodies were not created on the Fourth Day but were already in existence in the opening words of Gn 1:1. First, the opening verb of Gn 1:14 is identical to that appearing in Gn 1:3 (information that Ross does not supply to his reader). In Gn 1:14 the narrator writes: "Let there be lights," and in Gn 1:3 he writes, "Let there be light."[881] The translation "let there be," in both verses, comes from the Hebrew verb *hayah*, each using the identical form, tense, person, number and gender.[882] This same precise verb form appears also in Gn 1:6 in the creation of the firmament. In other words, the narrator uses the same verb *three* separate times, two of which Ross has already admitted refer to the *creation* of the entity in view (*e.g*., "let there be light" in Gn 1:3 and "let there be a firmament" in Gn 1:6), not some type of "unveiling." So why does Ross suddenly change the same verb form to mean "why" an object was created as opposed to specifying that it was actually created on that very day, just as the "light" and the "firmament" were created in their respective days? The answer is simple: it is only because of Ross' insistence on imposing modern science's Big Bang hypothesis into the text that he is willing to distort it in such a crude manner.

Ross' treatment of the Hebrew verb *asah* is equally dubious. In Genesis 1:16 the narrator writes: "And God made two great lights." The word "made" is the Hebrew *asah*.[883] Ross asserts that, because this verb represents a "completed action," it is referring to an event performed in the past, in this case, three days prior, on the First Day of Creation. But Ross' proposition is an egregious misrepresentation of the Hebrew language, not to mention the context of Genesis 1. Hebrew has only two basic tenses, the *perfect* and the *imperfect*. Of these, the *perfect* denotes a past, completed action, while the *imperfect* denotes the present or future.[884] The verb tense of *asah* in Gn 1:16 is the *imperfect*, not the *perfect*, and therefore it is referring either to the present or future, not the past. This is a terrible blunder by Ross, for it now raises the question of whether he is able to interpret the text correctly at all.

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[881] The only difference between the two clauses is that Gn 1:3 uses the noun אור (pronounced: *or*) for "light," while Gn 1:14 adds the common prefix to produce the base noun מאור (pronounced: *ma'or*) for "lights."

[882] The verb is היה (*hayah*) and is used hundreds of times in the Hebrew Old Testament. In Genesis 1:3, 6, 14 it is in the Qal Imperfect, third person, masculine, singular, יהי. Other uses of the same form in Genesis noted in Gn 30:34; 33:9; 49:17.

[883] The root of the Hebrew verb is עשׂה (*asah*) and appears in the Qal Imperfect, third person masculine singular with the *waw*-consecutive in Genesis 1:16.

Moreover, even if, perchance, the *perfect* tense was employed in Genesis 1:16, still, the writer could be using the past tense simply because he was writing the account after the event already had taken place.[885] Unfortunately, Ross does not enlighten his reader to these vital grammatical nuances regarding Hebrew tenses, yet he confidently assures him that the verb can only refer to an event in prior time. Unfortunately for Ross, once these blunders are discovered, his whole attempt at melding Genesis with the Big Bang theory is rendered utterly futile. For all of his innovative interpretations, Ross' attempt once again confirms that Genesis 1, literally and faithfully interpreted, defies any and all attempts to escape its consecutive sequence of six days of creative *fiat*, and thus denies every theory concocted by modern science as to how the world began. The only scientific theory that the Bible will sustain (without having its words twisted and contorted totally out of context, whether intentionally or not) is a cosmos that begins with the Earth created with the heavens, and then both of which are progressively adorned in six successive days with: firmament, plants, celestial bodies, fish, fowl, animals and man, respectively. Ross can believe whatever he chooses about evolution (and his books are a virtual library of interesting evolutionary theories), but he simply will not be able to reconcile that information with the text of Genesis without distorting both his own theories and Holy Writ.

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[884] The Hebrew language also contains infinitives, such as the Infinitive Absolute or the Infinitive Construct, or it can contain participles, but none of these are germane to what appears in Genesis 1:16. Hebrew can also put verbs in the active, passive, or reflexive voice, as well as signify the intensity of the verb (*e.g.*, the Piel, Pual, or Hitpael forms), but these do not apply to Genesis 1:16. The verb *asah* of Genesis 1:16 is one of the simplest forms in the Hebrew language, the Qal Imperfect, and thus should present no difficulty in meaning to one who knows the Hebrew language.

[885] We write the same in English. The sentence "John made Mary a hat on the fourth day of their honeymoon," does not mean that John made the hat on the first day. No matter what past tense form we use (*e.g.*, "had made," "did make") the fact that the "fourth day" is specified as the time of completion limits the action to the fourth day. The only way this interpretation could be modified is if "fourth day" were symbolic or metaphorical of a previous day. That type of interpretation, however, is ruled out in Ross' case since, by his own admission, he has confined himself to a literal, or even "scientific," interpretation.

Higher Criticism and the Interpretation of Genesis 1-2

Ever since Copernicus and Galileo, the Bible has been the subject of intense scrutiny and much criticism. The prevailing question for the last 500 years, and even more intensely in the last 100 years or so with the onset of Darwinism is: Can the Bible be trusted to give us factual and truthful statements of history and the cosmos, or is theology the Bible's only reliable and exclusive domain? It cannot be dismissed that the debate between modern science and biblical science is a unique glimpse into a much larger and more critical area of controversy today, an issue that centers squarely on the very veracity of the Bible and how we are to interpret its words.

As we have shown repeatedly in this volume, we can safely believe that the Bible is to be trusted in everything it says, not only in theology, but in every area it puts its divine stamp of truth, including history and the cosmos. Unfortunately, a large number of biblical scholars who have embraced the Higher Critical theories of secularism have begun to advocate a departure from both the inerrancy of Holy Writ and a literal interpretation of its words. Liberal Catholic scholars of today collectively voiced their dubious opinions in the *New Jerome Biblical Commentary*:

> ...of Dei Verbum.... debates show an awareness of errors in the Bible. Thus...Scriptural teaching is truth without error to the extent that it conforms to the salvific purposes of God.[886]

In other words, these neo-orthodox theologians believe Scripture is subject to error when it speaks on issues of history, chronology, science, mathematics or the cosmos. It is no coincidence that most of the theologians who espouse biblical errancy are also evolutionists. Ever since the Church's confrontation with Galileo, they simply don't trust the Bible to give accurate historical information. Fr. Raymond Brown, editor of the *New Jerome Biblical Commentary*, criticizes what he calls "the Catholic right" who insist on: (a) the literal interpretation of the Genesis account, namely, creation in six days or six periods of time; (b) that human beings did not evolve from lower species; (c) that woman was formed from man's body; and (d) that life at the beginning of time was in an idyllic state.[887]

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[886] *The New Jerome Biblical Commentary* (c. 1990), p. 1169, edited by Fr. Raymond Brown, along with Fr. Joseph Fitzmyer and Fr. Roland Murphy. Brown deceased in 1998, but probably remains one of the most influential liberal Catholic scholars of the past fifty years. In another of his works Fr. Brown writes: "In the last hundred years we have moved from an understanding wherein inspiration guaranteed that the Bible was totally inerrant to an understanding wherein inerrancy is limited to the Bible's teaching of 'that truth which God wanted put into the sacred writing for the sake of our salvation'" (Raymond Brown, S.S., *The Virginal Conception and Bodily Resurrection of Jesus*, New York, Paulist Press, 1973, pp. 8-9).

In their reinterpretation of Genesis, neo-orthodox scholars posit that the creation accounts in Genesis 1 and Genesis 2, respectively, are contradictory. In addition, they hold that Genesis 1 is not real history but merely a Jewish recapitulation of the Babylonian creation myth *Enumu Elish*[888] concerning the ancient god Marduk and his conquering of the

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[887] *Origins*, May 7, 1981, p. 739. Fr. Brown also calls his Catholic critics "fundamentalists," and has some very harsh words for those who criticize his methodology of biblical hermeneutics. But as Stephen Clark has written: "Many who use the term [fundamentalist] in an inaccurate, derogatory way have come under the strong influence of secular humanism (liberal Protestantism, Modernism). They use the word as a term of abuse to discredit their more orthodox opponents. These people interpret scripture as a book which does not have God as its author in any significant sense, and as a book without real authority. Their approach to interpretation comes out of a line of thought which has compromised the fundamentals of the faith (including the articles of the creed and the commandments), and that seeks to interpret scripture in a way that allows that compromise" (*Man and Woman in Christ*, p. 350).

[888] *Enumu Elish* means "When on high." Some of the lines of *Enumu Elish* read as follows: When above the heaven had not been named; and below the earth had not been called by a name; when Apsu primeval, their begetter; Mummu, and Ti amat, she who gave birth to them all; still mingled their waters together; And no pasture land had been formed and not even a reed march was to be seen; When none of the other gods had been brought into being; When they had not yet been called by their names, and their destinies had not yet been fixed; at that time were the gods created within them; Lahmu and Lahamu came into being; they were called by their names; Even before they had grown up and become tall; Anshar and Kishar were created; they surpassed them in stature; They lived many days, adding years to days; Anu was their heir presumptive, the rival of his fathers; Yea, Anu, his first-born, equaled Anshar; Yea, Anu, his first-born, equaled Anshar; And Anu begot Nudimud, his likeness; Nidimud, the master of his fathers was he; He was broad of understanding, wise, mighty in strength; Much stronger than his grandfather, Anshar; He had no rival among the gods of his brothers... (*The Babylonian Genesis*, Alexander Heidel, 2nd ed. University of Chicago Press, 1951, p. 8). It is amazing that scholars would once claim that *Enumu Elish* is the very "model" of Genesis, adding that the latter is a poor copy of the former. Enumu Elish is almost twice the length of Genesis 1, meandering from topic to topic; it is not a creation story, whereas Genesis clearly is; it is mythical poetry, whereas Genesis is didactic and academic, devoid of myth; Marduk appears on the scene very late, whereas Elohim is the only agent making his world; Marduk struggles, whereas Elohim merely speaks and the work is done; Marduk is picked by the

"waters of chaos."[889] They also believe that Genesis 1-2 is: (a) not historical but merely a contest between two literary forms, the so-called Yahwist and the Elohist; (b) that the Genesis writer had no interest in astronomy or biology and was as primitive in his thinking as the average pygmy today in Africa; and (c) that too much insertion of God into the cosmos is "akin to the monophysite heresy of the fourth century."[890] All of these assertions can be dismissed by remembering that Scripture is very clear that, to Moses, the writer of Genesis, God spoke "face to face," and

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gods because they want revenge, whereas Elohim is in competition with no one and serves no one; Marduk is a bloody warrior and creates mayhem, whereas Elohim creates beauty and order; Marduk is constantly agitated and anticipating his next battle, whereas Elohim rests contently after his constructive work. If anything, Enumu Elish appears to be a corrupt form of Genesis 1.

[889] Richard Clifford, S. J., in the *New Jerome Biblical Commentary*, states: "In Mesopotamian culture, evidently the model for most of the stories in Genesis 1-11, scribes explored beginnings through stories and cosmogonies, not through abstract reasoning....Genesis 1-11 then is a single story, an unusually sustained 'philosophical' and 'theological' explanation of the human race....The biblical writers have produced a version of a common Mesopotamian story of the origins of the populated world, exploring major questions about God and humanity through narrative" (pp. 8-9). In contrast, Bruce Vawter in *A Path Through Genesis* (Sheed and Ward, 1958) and *On Genesis: a New Reading* (Doubleday, 1977) admits that the author of Genesis 1 intentionally crafted a sharply different cosmology than *Enumu Elish*. Vawter writes: "Genesis took itself seriously as serious history….Genesis has been written out of an historical experience that was independent of the materials of which it fashioned its history, or better, which found in these materials resonances and insights that corresponded with the experience….Genesis stands apart from the rest of the Near Eastern myth and folklore to which it is otherwise so evidently related" (*On Genesis*, pp. 30-31). The contrasts are: many gods versus one god; gods as part of the world versus God not part of the world; matter exists first versus God exists first; stars help create the world versus stars being created on the fourth day; sea creatures rival the gods versus sea creatures as mere creatures. As Sir Frederic Kenyon states: "There is almost nothing to link the [Babylonian] narrative to that of Genesis" (*A Catholic Commentary on Holy Scripture*, London: Nelson, 1953, p. 184). Clifford's reinterpretations of Genesis contradict the finding of the 1909 Biblical Commission: "Whether we may, in spite of the character and historic form of the book of Genesis...teach that the three aforesaid chapters do not contain the narrative of things which actually happened, a narrative which corresponds to objective reality and historic truth; and whether we may teach that these chapters contain fables derived from mythologies and cosmologies belonging to older nations...Answer: in the negative to each part."

[890] As stated by Georgetown theology professor John Haught, *Commonweal*, January 28, 2000.

in those encounters revealed to him things about the world that could never be known by reason, observation or least of all "historical criticism."[891] Because of these encounters, starting with God's speaking to Noah, Abraham and Jacob, the Jews knew things about God and the creation that "Marduk" wouldn't even hear of for more than a millennia.[892] As Moses told them in Dt 4:6-7:

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[891] Exodus 33:11. As Basil writes: "We are proposing to examine the structure of the world and to contemplate the whole universe, beginning not from the wisdom of the world, but from what God taught his servant Moses when He spoke to him in person and without riddles" (*The Hexameron*, Homily 6, 1; 1, 1).

[892] Unfortunately, some Catholic exegetes have been heavily influenced by the historical-critical theory that Genesis 1 was not written until the return from Babylonian captivity between 515 and 445 B.C. Stanley Jaki states: "And since Genesis 1 is, on stylistic grounds alone, a patently post-exilic document..." in *Bible and Science*, p. 45, yet Jaki equivocates in *Genesis 1 Through the Ages*, pp. 25-26 and says that "accepting higher criticism about the three or more different sources of Genesis that almost force one to date Genesis 1 as post-exilic" (*ibid*., p. 62). He traps himself, however, in his remarks on Psalm 104. After quoting, "You have spread out the heavens like a tent-cloth; you have constructed your palace upon the waters," Jaki states that the phrase, 'Nor shall they cover the earth again' "includes a post-diluvian perspective" which " does not seem to bother the Psalmist." This means that the Psalmist would have had the information both of Genesis 1 and Genesis 7-9 in order to make such a comparison between the two waters. If, as Jaki claims, Genesis 1 is "post-exilic" (a sixth century BC occurrence), Psalm 104, having been written about the eleventh century BC, would have no record of the "waters," and thus, contrary to Jaki, Genesis 1 could not be "post-exilic." We see the same sort of logic in Jaki's view that the book of Ezekiel is "certainly a post-exilic product" (*ibid*., p. 5). Jaki simply ignores the fact that Ezekiel makes it quite clear that he is predicting, and eventually in the midst of, the Babylonian captivity, not subsequent to it. To claim, as Jaki does, that Ezekiel is "post-exilic" means that there is no real prophecy in Ezekiel; rather, Ezekiel merely poses his after-thoughts as prophecy to give the impression of divine revelation. Modern scholars do the same with Daniel. All of Daniel's prophecies are said to be written "after the fact," and thus the so-called "prophecies" are merely historical recountings, not predictions of the future. Although holding to evolution, Jaki does admit: "...the evolution of the universe, from very specific earlier states to a very specific present state, nothing is, of course as much as intimated in Genesis 1. Much less should one try to find there the idea of a biological evolution..." Jaki also admits: "In other words, nothing can any longer gloss over the fact that the fossil record defies the mechanism of evolution proposed by Darwin...the paleontological record was never known to have contained clear transitional forms, let alone a series of gentle gradations leading up to man....The only solid ground for holding evolution is belief in the createdness of the universe, and therefore in the strict interconnectedness of all its parts, a feature demanded by the infinite rationality of the Creator" (*ibid*. pp. 145-

> The people of the world will hear of these statutes and say, 'Surely this great nation is a wise and understanding people. For what great nation is there that has a god so near to it as is the Lord our God whenever we call on Him?[893]

In opposition to interpreting Genesis as recording literal and historical events, much opposition is raised today claiming, "Scripture is not a science book." This is designed to have a chilling effect on the biblical literalist. The non-literalist will claim that science has shown, for example, that the light of Gn 1:3 and the sun of Gn 1:14 are one in the same, so there cannot be two different creation days.[894] He will claim that science has shown that, in opposition to Gn 1:2, the earth could not have been the first object in the universe, since the Big Bang says that matter exploded and then formed stars and galaxies billions of years before the earth appeared. He will claim that Gn 1:6's insistence on a "firmament," which the Bible at times describes as a "vault" and at other times as being "spread out," does not match anything science has discovered in the near or far reaches of space. And even if these ideas of science have not been proven, the non-literalist believes that the circumstantial evidence for their validity is enough to put in doubt the rather primitive descriptions in Scripture. A common mantra is, if science hasn't yet found the answer, it will find it someday, but in the meantime it is justifiable to dismiss the Bible's primitive cosmology and cosmogony.

So what is the biblical literalist to do? He firmly believes that, although unsophisticated, by modern standards, the historical items in Scripture are true and trustworthy in their essence. He finds it very difficult to accept that God, who he believes inspired every word of Scripture, would record something *as if* it happened but in reality never

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146). It is hard to say why Jaki feels he must limit God's "rationality" to evolution as opposed to instantaneous, *ex nihilo*, creation.

[893] This is especially significant, since the oldest extant copies of *Enumu Elish* come from the 11th century B.C., four hundred years after Moses, and twelve hundred years after Abraham. W. G. Lambert writes: "...has shown evidence that Marduk...rose to officially sanctioned preeminence only in the late 12th century under Nebuchadnezzar I" (*New Catholic Encyclopedia*). If anything, this means the likelihood is the Hebrew tradition had influenced the surrounding pagan cultures, rather than vice-versa, but modern Scripture scholars refuse to admit this possibility.

[894] Jaki shows his displeasure by stating: "...that fourth day, perennially troublesome for those fond of waving their Bibles" (*Genesis 1 Through the Ages*, p. 168).

happened. For him, the very veracity of God and Scripture are at stake.[895] Whereas the non-literalist may give a token effort to solving some of the exegetical difficulties in Genesis, he is more comfortable concluding that such solutions are not really necessary, for, after all, "Scripture is not a science book" and was never meant to be pigeon-holed into scientific cages. Moreover, he believes that because of its primitiveness Scripture is susceptible, if not prone, to error in matters too sophisticated for it to handle, but science is relatively free of error, for in confronting the questions of the modern age it relies on sophisticated tools and precise methodologies. Conversely, the literalist will strive to harmonize both Scripture and science, seeking to balance the two, always holding Scripture as the final authority. For there is one thing the literalist believes for certain: Scripture cannot err, whether in matters spiritual or physical, soteriological or historical. Conversely, science, whether the non-literalist wants to admit it or not, has one devastating handicap: its history is riddled with the overturning of one theory after another; one popular belief, which was thought to be fact, so quickly discarded for another popular belief, now proposed as fact.

Seeing the determination of the literalist, today it is not uncommon for theistic evolutionists, progressive creationists and Galileo admirers to counter such efforts by appealing to the words of St. Augustine regarding the interpretation of Scripture. In his book, *The Literal Meaning of Genesis*, he writes:

> Usually, even a non-Christian knows something about the earth, the heavens, and the other elements of this world...Now, it is a disgraceful and dangerous thing for an infidel to hear a Christian, presumably giving the meaning of Holy Scripture, talking nonsense on these topics; and we should take all means to prevent such an embarrassing situation, in which people show up vast ignorance in a Christian and laugh it to scorn. Reckless and incompetent expounders of Holy Scripture bring untold trouble and sorrow on their wiser brethren when they are caught in one of their mischievous false opinions and are taken to task by those who are not bound by the authority of our sacred books.[896]

Seizing on Augustine's words, the non-literalist chides the literalist, accusing him of "presuming a meaning on Scripture" that in scientific terms is "nonsense," which causes an "embarrassing situation" and a "laughing to scorn" of the "wiser brethren" of Christianity.[897] The literalist will grant that there are many difficulties in arriving at a consistent one-to-one correspondence between Genesis and science (*e.g.*, how to interpret the appearance of the earth in water in Gn 1:2; the light of Gn 1:3 coming prior to the sun and stars in Gn 1:14; the identity and extent of the firmament in Gn 1:6; the appearance of plants in Gn 1:11 before the sun in Gn 1:14). In his search for solutions, the literalist retorts that he certainly has no intention of causing an "embarrassing situation," and he can prove it by bringing Augustine to his aid. He will tell the non-literalist he is misconstruing Augustine's words, and in reality, the words are more of an indictment against the non-literalist. For Augustine goes on to explain to whom he is applying his words a few pages later. In Book 2, Chapters 4-5, the question of the "waters above the firmament" (Gn 1:6-9) comes to the fore. These distant waters have been one of the more divisive issues between literalists and non-literalists, since the firmament is, according to Genesis 1:14-17, the heavens in which the sun and stars were placed, yet Genesis 1:7 insists that there are waters above the firmament, that is, above the heavens. The logical question is: if the "water above" is to be taken literally, then when, where, why and how is this possible, for it seems to contradict the established facts of science. In answer, Augustine begins by referring to vaporous waters in the air as a possible solution. He writes:

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[895] As one who feared not to apply the science of his day to Genesis 1, Augustine stated: "...the credibility of the Scripture is at stake" (*Confessions*, Bk 2, Ch 9).

[896] *The Literal Meaning of Genesis*, Bk 1, Ch. 19, No. 39:

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[897] Not surprisingly, Jaki uses Augustine's quote several times in his favor in an attempt to obliterate "concordism" from the exegetical landscape (*Genesis 1 through the ages*, pp. 90-91; 141; 174). But even before Augustine, the first "concordist" Jaki attacks is the allegorist Philo, since, "as much as he took Genesis 1 not for its own sake and in its own true character but as an illustration and embodiment of some thing else" (*ibid.*, p. 43). What we find in Jaki's book is essentially a search through history to find anyone who agrees with Jaki's interpretation of Genesis 1. If the author is a "concordist," Jaki summarily dismisses him, which he ends up doing about 95% of the time. A concordist is understood as anyone who attempts to apply science, to whatever degree, to Genesis 1. Jaki's favorite litmus tests are: (a) what does the author do with the Light on the first day in contrast to the sun's light on the fourth day; (b) what does the author do with the Firmament made on the second day, as well as the waters above it; (c) what does the author do with the Hebrew word *bara* in Genesis 1:1, a word Jaki is adamant cannot mean "created" but "to split" or "to slash." (We will address this point in detail later). (See pages 79, 94, 97, 116, 119, 130 for further evidence of Jaki's litmus tests). To his dismay, Jaki finds hardly anyone who even mentions, let alone sides with, his view of Genesis 1 (*ibid.*, p. 64), which, being a repetitive droning in his book, is the proposition that the only thing with which the Genesis 1 writer was interested is demonstrating the creative power of God by means of stating the "whole" ("In a certain beginning God created the heavens and the earth") and then stating some of its "parts" (some, but only few of the things created). (See pages 21, 61, 72, 95, 132, 156 to see the repeated emphasis of Jaki's theme). To Jaki, Genesis 1 was written to the "reader at that time" (*ibid.*, p. 61) and only inadvertently for others, and therefore it could not even broach the complicated area of cosmogony, let alone explain it. For Jaki, Genesis 1 is merely "post-exilic" literature designed to reinvigorate the Jews coming out of seventy years of Babylonian captivity; not to serve as an historical model of origins, even on an elementary level.

> Taking these theories into account, a certain commentator [Basil] has made a praiseworthy attempt to demonstrate that the waters are above the heavens, so as to support the word of Scripture with the visible and tangible phenomena of nature.... Hence, from the existence of the air between the vapors that form the clouds above and the seas that stretch out below, our commentator proposed to show that there is a heaven between water and water. This painstaking enquiry is, in my opinion, quite praiseworthy.

But Augustine goes even further in the next analysis, for now he tries to show that there are waters even above the starry heavens. He does so by calling into question the prevailing scientific theories, and in the end, relying on the veracity of Scripture, no matter how hard it may be to accept. He writes:

> Certain writers, even among those of our faith, attempt to refute those who say that the relative weights of the elements make it impossible for water to exist above the starry heaven. They base their arguments on the properties and motions of the stars. They say that the star called Saturn is the coldest star, and that it takes thirty years to complete its orbit in the heavens because it is higher up and therefore travels over a wider course.

We notice that Augustine is challenging the prevailing scientific opinion current in his day regarding the nature of stars. Augustine will go on to argue that Saturn, which was then understood as a star, generates heat as it makes its orbit, but that it is cooled by the waters near it, above the heavens, even though some in Augustine's day denied that these waters existed. He writes:

> It is true, indeed, that by its own motion, moving over a vast space, it takes thirty years to complete its orbit; yet by the motion of the heavens it is rotated rapidly in the opposite

> direction...and therefore, it ought to generate greater heat by reason of its greater velocity. The conclusion is, then, that it is cooled by the waters that are near it above the heavens, although the existence of these waters is denied by those who propose the explanation of the motion of the heavens and the stars that I have briefly outlined.

Finally, although admitting he may not have the precise solution to the issue, nevertheless, Augustine maintains that Scripture is the greater authority in this realm, and if it says that the water is above the heavens, then it is there:

> With this reasoning some of our scholars attack the position of those who refuse to believe that there are waters above the heavens while maintaining that the star whose path is in the height of the heavens is cold. Thus they would compel the disbeliever to admit that water is there not in a vaporous state but in the form of ice. But whatever the nature of that water and whatever the manner of its being there, we must not doubt that it does exist in that place. The authority of Scripture in this matter is greater than all human ingenuity.[898]

In contrast to Augustine's determination to take Scripture at its word and afterward seek for evidence, Stanley Jaki sees Augustine's resolve as misguided. After recognizing that "Augustine looked for it in a vaporous layer in the orb of Saturn," (p. 26), Jaki writes:

> Augustine's search for the firmament should seem baffling. It certainly seemed to slight the very sound principle he had already laid down in respect to reconciling truths known by reason about the physical world with corresponding propositions in the Bible.[899]

Jaki characterizes Augustine's search for the firmament and the water above it as "baffling"; an approach of Augustine's that seems inconsistent with his previous principle of giving the first place to scientific truths and only then finding the corresponding proposition in Scripture which match them. In reality, it is Jaki who has misunderstood Augustine's so-called "very sound principle." It was never Augustine's intention to give absolute authority to science. All along, although trying to be fair with science, Augustine always held that Scripture's propositions took the first place, and only then could one search for a corresponding scientific truth, not vice-versa. This is obviously the case with Augustine's view of the waters above the firmament, since for him, regardless of whether he had the right scientific answer to its location and composition, he maintained: "the authority of Scripture in this matter is greater than all human ingenuity."

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[898] *The Literal Meaning of Genesis*, Bk 2, Ch. 5, No 9.
[899] *Bible and Science*, p. 95.

The most penetrating aspect of Augustine's bold defense of Scripture is that it is said in a context in which the objector doubts whether water above the firmament exists at all. Augustine's answer is simple: we may not know where or in what form it resides there, but based on Scripture we know for certain that it exists. This is where Augustine starts. It is his bedrock of truth. The Scripture said it, and he believes it. Hence we can safely say that, for Augustine, the "embarrassing situation" does not necessarily occur when a faithful expositor tries to find scientific support for biblical propositions, but occurs when the biblical skeptic tries to elevate scientific theory into fact, requiring Scripture either to conform to the theory, or be totally ignorant of the theory. As Augustine warned:

> But more dangerous is the error of certain weak brethren who faint away when they hear these irreligious critics learnedly and eloquently discoursing on the theories of astronomy or on any of the questions relating to the elements of this universe. With a sigh, they esteem these teachers as superior to themselves, looking upon them as great men; and they return with disdain to the books which were written for the good of their souls; and, although they ought to drink from these books with relish, they can scarcely bear to take them up.[900]

So now we come back to the question of whether Scripture is a science book. Obviously, the answer to that question is not a simple yes or no. Even the heliocentrist, John Henry Cardinal Newman noted that Scripture teaches the Earth is immovable:

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[900] *The Literal Meaning of Genesis*, Book 1, Chapter 20, Para. 41, *Ancient Christian Writers*, *ibid.*, p. 44. Aquinas said the same thing regarding the superiority of Scripture to decide such matters: "Whether, then, we understand by the firmament the starry heaven, or the cloudy region of the air, it is true to say that it divides the waters from the waters, according as we take water to denote formless matter, or any kind of transparent body, as fittingly designated under the name of waters..." (*Summa Theologica*, Bk. 1, Ques. 68, Art 3).

> It is true, then, that Revelation has in one or two instances advanced beyond its chosen territory, which is the invisible world, in order to throw light upon the history of the material universe. Holy Scripture, it is perfectly true, does declare a few momentous facts, so few that they may be counted, of a physical character. It speaks of a process of formation out of chaos which occupied six days; it speaks of the firmament, of the sun and moon being created for the sake of the earth; of the earth being immovable; of a great deluge and of several other similar facts and events.[901]

For all his fear about "concordism," even Jaki admits that the language of Genesis 1 is absolutely unique, both in comparison to other biblical passages and to various ancient documents on cosmology. He writes:

> The lucidly streamlined character of Genesis 1 should suggest that its author wanted to offer something very different from the cosmological myths of surrounding cultures. Even according to those who want to see in Genesis 1 at least the remnants of some myths composed in mythological times, Genesis 1 appears conspicuously void of mythical elements.... this also explain why Genesis 1 is so different from all the other chapters of the Book called Genesis, indeed from almost all chapters of all the Books of the Old Testament. Unlike all those chapters, whatever their great variety, this chapter is not the story of a battle, of an encounter, of a plot. It is certainly not a history. It is not a moral exhortation, a parable, a prophecy, and not even a song as some claimed, and certainly not a ledger for stock-talking as is the case in Numbers throughout. All these literary forms were present in the Hebrew scriptures...[902]

Nevertheless, we must also insist that interpretations such as Jaki's are not really interpretations at all. They are anti-interpretations, fearful of applying just about anything to Genesis 1, except, as Jaki claims, that it demonstrates a literary technique of "allowing the part to represent the whole."[903] But this is no great revelation. It goes without saying that in any type of discourse the part will invariably represent the whole. In fact, all people who write narratives, whether intentionally or not, incorporate that very principle. Obviously, no one could ever list *all* the parts of something since such a number would be astronomical and impractical.

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[901] *The Idea of a University*, Garden City, NY: Doubleday, 1959, Regency Publishing, 1999, pp. 396-397.

[902] *Genesis 1 Through the Ages*, pp. 22, 27.

[903] Jaki makes this his constant theme throughout Genesis through the ages (*cf.*, pp. 21, 61, 72, 95, 132, 156).

Yet Jaki is insistent that the Hebrews "did not take Genesis 1 for a physics textbook, for the very simple reason that they had no physics."[904] They "had no physics"? None at all? Does it take a mathematical equation such as $F = ma$ or $E = mc^2$ to say that men know physics? Certainly the Hebrews knew that objects dropped from heights fall to the ground; that axe heads do not float on water unless by miracle; that birds fly by flapping their wings against the air. Mathematical formulas do not make physics, they only give a numerical proportion of one value compared to another. In fact, mathematical formulas can be quite deceiving, since formulas deal only with mental intuition that may or may not represent reality. The irony of ironies is that the very concepts of Galilean, Newtonian, and Einsteinian physics, especially the latter's Relativity theory, are just that – numbers that have no way of proving that they describe physical reality. In fact, modern man's ignoring of certain fundamental facts of "physics" established in Scripture has led him to postulate some of the most fantastic and absurd theories to avoid having to submit to Scripture.[905] Someday we may come to realize that the simple notions of the Hebrews are much closer to the truth than the sophisticated theories of modern man. As noted previously, there is one thing about science common to all its branches (including philosophy, psychology, medicine, chemistry, biology, *etc.*), that is, its history shows that it cannot cease from overturning its own theories, whereas the Bible's "science" always remains the same. In actuality, what little verifiable truth is discovered in science, the more the Genesis account is vindicated as being a precise record of what occurred in the past.

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[904] *Ibid.*, p. 25.

[905] As the sixth century theologian John Philoponus stated: "...nothing in the makeup of this world is different from the Prophet's treatment of it; in actuality, most of the things whose origins were investigated by scientists have their origin in Moses' book" (cited in Jaki's book, *Genesis 1 through the ages*, p. 99, from De opificio mundi, ed G. Reichardt, Leipzig: G. B. Teubner, 1897, p. 6. It is no coincidence that, after his instruction at the Bavarian schools which included teaching on the Catholic religion, especially of the six-day creation, which ended at age twelve, Einstein said that after the "reading of popular scientific books" he "soon reached the conviction that much in the stories of the Bible could not be true" (*ibid.*, p. ix, *Einstein: The Life and Times*).

The Genesis Day/Night Sequence Revisited

As we have noted earlier, some Christian scholars are reticent to assign a literal day/night sequence to Genesis 1 due to nothing more than the fact that the sun and stars appear on the Fourth Day rather than the First Day. The objector claims that, since today it is obvious that the sun causes the day/night sequence on Earth, there could have been no day/night sequence before the sun was created, and therefore, the days of Genesis are neither literal nor chronological. Stanley Jaki considers this argument his strongest in denying a chronological, 24-hour/day period to Genesis 1. For him, if the sun is missing from the first day, then there can be no darkness and light, and thus the days of Genesis are symbolic of long periods of time, or the sun existed on the first day and is recapitulated on the fourth day.[906] Jaki is well aware of the fact, however, that neither the Fathers of the Church nor the medieval theologians who followed them saw any problem with having two sources of light on the First and Fourth Day, respectively. For example, being consistent with his literal hermeneutic, Thomas Aquinas postulated that the effusive light on the First Day was then made into the sun and stars on the Fourth Day, perhaps similar to God fashioning man on the Sixth Day from the dirt He created on the First Day.

> Now it seems to be required, for two reasons, that the formlessness of darkness should be removed first of all by the production of light. In the first place because light is a quality of the first body, as was stated, and thus by means of light it was fitting that the world should first receive its form. The second reason is because light is a common quality. For light is common to terrestrial and celestial bodies. But as in knowledge we proceed from general principles, so do we in work of every kind.

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[906] *Genesis 1 through the ages*, p. 144. Jaki claims that by 1520 "...it was no longer possible not to take the sun for the source of light in Gen. 1:3." He writes: "Where is the biblical suggestion that light crystallizes into sparkling celestial bodies" (p. 62). He lays the blame at the "...concordist exegesis of many of the Church Fathers..." (p. 169) seemingly unmoved by his dismissal of this Tradition; and at the same time dismissing Protestants for holding similar views which were derived from "waving their Bibles" (p. 168). Early claims to Jaki's view occur in such exegetes as Eusthatius, who objects to Basil's idea of "light and heat coming together on the fourth day" with the words "How can this be if there is no evidence for such a distinction, since we neither see light distinct from fire, nor fire distinct from light" (PG 18, 718); yet quite a few agree with Basil that the light of the first day condensed into the heavenly bodies of the fourth day.

For the living thing is generated before the animal, and the animal before the man, as is shown in *De Generatione Animalibus* ii, 3). It was fitting, then, as an evidence of the Divine wisdom, that among the works of distinction the production of light should take first place, since light is a form of the primary body, and because it is more common quality.

Basil (*Hom. 2 in Hexaemeron*), indeed, adds a third reason: that all other things are made manifest by light. And there is yet a fourth, already touched upon in the objections; that day cannot be unless light exists, which was made therefore on the first day.

According to the opinion of those who hold that the formlessness of matter preceded its form in duration, matter must be held to have been created at the beginning with substantial forms, afterwards receiving those that are accidental, among which light holds the first place.

In the opinion of some the light here spoken of was a kind of luminous nebula, and that on the making of the sun this returned to the matter of which it had been formed. But this cannot well be maintained, as in the beginning of Genesis Holy Scripture records the institution of that order of nature which henceforth is to endure. We cannot, then, say that what was made at that time afterwards ceased to exist.
Others, therefore, held that this luminous nebula continues in existence, but so closely attached to the sun as to be indistinguishable. But this is as much as to say that it is superfluous, whereas none of God's works have been made in vain. On this account it is held by some that the sun's body was made out of this nebula. This, too, is impossible to those at least who believe that the sun is different in its nature from the four elements, and naturally incorruptible. For in that case its matter cannot take on another form.

I answer, then, with Dionysius (*De Divinis Nominibus iv*), that the light was the sun's light, formless as yet, being already the solar substance, and possessing illuminative power in a general way, to which was afterwards added the special and determinative power required to produce determinate effects. Thus, then, in the production of this light a triple distinction was made between light and darkness. First, as to the cause,

> forasmuch as in the substance of the sun we have the cause of light, and in the opaque nature of the earth the cause of darkness. Secondly, as to place, for in one hemisphere there was light, in the other darkness. Thirdly, as to time; because there was light for one and darkness for another in the same hemisphere; and this is signified by the words, “He called the light day, and the darkness night.”[907]

Some scholars claim that the use of the Hebrew ויעשׂ (from עשׂה (*asah*): “made” in the clause “And God made”) rather than the word ברא (*bara*: “created” in the clause “In the beginning God created...”) means that the celestial bodies were already in existence on the First Day but became available for observation on the Fourth Day. The fact is, however, that “made” (וַיעשׂ) is also employed in Gn 1:7 when the firmament is created to divide the waters. The appearance of the firmament is certainly a separate act of creation, since it is the only event recorded for the Second Day. Obviously, then, “made” is equivalent to “create.” The same word (ויעשׂ) appears also in Gn 1:25 in reference to the appearance of the animals. It also appears in both Ex 20:11 and 35:17 in the sentence, “For in six days God *made* the heavens and the earth...” showing again that “made” is completely interchangeable with “created.”

That the sun created on the Fourth Day takes over the day/night sequence from the light created on the First Day is an important fact. Since today as in the past we know that the sequence of darkness to light caused by the sun is a 24-hour period, this allows us to take the same 24-hours and extrapolate back to the first three days of creation when there was no sun but only light. In other words, the mechanics of the Fourth Day allows us to know that the First, Second and Third Days were 24-hour periods. Moreover, since Gn 1:14-17 indicates that the sun is made to fit the day rather than the day to fit the sun, this is further confirmation that the Creation days were of the same length. Since the 24-hour period of the sun's rising and setting must fit into the Day, it means the Day must have already been established as a 24-hour period prior to the Fourth Day. In this respect, various passages indicate that heaven's time is coincident with earthly time in the day/night sequence.[908] One additional fact worthy of note is that the Light of Gn 1:3 must be light of a wavelength in the visible spectrum, that is, not long radio waves or short gamma rays, but a wavelength which would create the evening/morning sequence specified by the text.

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[907] *Summa Theologica*, Bk 1, Ques. 67, Art. 4. Agreeing with Aquinas here are: Gregory of Nyssa (*Hexameron*, PG 44, 66-118); Ephrem the Syrian (*Genesim et in Exodum commentarii*, in CSCO, v. 152, p. 9); Chrysostom (*Homilies on Genesis* (PG 53, 57-58); See especially, Basil in *The Hexameron*, Homily II, 7;Victorinus in *On the Creation of the World*. The opposite viewpoint is held by Origen in *Origen Against Celsus* “By far the most silly thing is the distribution of the creation of the world over certain days, before days existed; for, as the heaven was not yet created, nor the foundation of the earth yet laid, nor the sun yet revolving, how could there be days?” (Book VI, Ch 60). Leo the Great stated: “But what is the sun or what is the moon but elements of visible creation and material light: one of which is of greater brightness and the other of lesser light? For as it is now day time and now night time, so the Creator has constituted divers kinds of luminaries, although even before they were made there had been days without the sun and nights without the moon” (Sermon XXVII). Medieval theologians are also of the same opinion: Honorius of Autun (*Hexameron* PL 172, 257); Peter Lombard (*Lombardi opera omnia*, PL 192, 651); Colonna, aka Aegidius Romanus (*Opus Hexaemeron*); Nicholas of Lyra (*Postillae perpetuae*); Cajetan *(Commentarii de Genesis 1*).

Other scriptural accounts also indicate clearly that the Light of Gn 1:3 is separate from the sun and stars of Gn 1:14-17. For example, in the book of Job, God interrogates Job with rhetorical questions that he knows Job cannot answer. In chapter 38:18-24 God asks Job:

> [18]Have you understood the expanse of the earth? Tell Me, if you know all this. [19]Where is the way to the dwelling of light? And darkness, where is its place, [20]That you may take it to its territory And that you may discern the paths to its home? [24]Where is the way that the light is divided, Or the east wind scattered on the earth?

The fact that Job cannot answer these questions rules out the sun and stars Job sees everyday as a possible retort to God's question. It is thus readily apparent that God is teaching us through this revelatory dialogue a fact about the constitution of light that we could not determine on our own, that is, this particular light has a source that is not from the stars or sun. Of course, in order to accept this unique information one must accept that Scripture is giving trustworthy propositional truth and not mere fables and myths to "uneducated peoples."

Jb 26:10 reads: "He has inscribed a circle on the surface of the waters at the boundary of light and darkness." The "circle" here refers to the earth itself, and is speaking about God's creation of the earth in the midst of the waters in Gn 1:2 and 2Pt 3:5 in which "long ago the earth was formed out of water and by water." It is this circle (or sphere) of the earth that is between the boundary of light and darkness at the beginning of creation.

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[908] Ap 8:1: "there was silence in heaven for about half an hour"; Jb 1:6-7: "Now there was a day when the sons of God came to present themselves before the Lord, and Satan also came among them. The Lord said to Satan, 'Whence have you come?' Satan answered the Lord, 'From going to and fro on the earth, and from walking up and down on it.'"

As for the distinction between light and the sun, various passages testify to this phenomenon. For example, Psalm 74:16 states: "Yours is the day, Yours also is the night; You have prepared the light and the sun." Ec 12:1-2 prohibits one from concluding that the "light" of Ps 74:16 refers to the stars since it separates it from the sun: "Remember also your Creator in the days of your youth...before the sun and the light, and the moon and the stars are darkened." Notice how the writer mentions all the known luminous bodies that emanate light, but he insists there is still an additional independent source of light. As in Ps 74:16, these four sources are specifically put in sequence by Hebrew *waw*-conjunctions so that it does not say "sun's light" but the sun and the light and the moon and the stars.[909]

Some theories hold that the Light of Gn 1:3 represents God or that God Himself was the source of the Light. This is untenable, since before the Light of Gn 1:3 there was total darkness in Gn 1:1-2. Since God, if He were to be associated with Light, would always be luminous, then there would have been no darkness to dispel. Moreover, the finite verb "let there be" (יהי) is employed for the Light in Gn 1:3 the same as it is for the firmament in Gn 1:6 and the celestial bodies of Gn 1:14, thus showing that the verb refers to something created out of nothing and not to something already existing.

Another objection to separating the First Day and the Fourth Day is the claim that the light from both days is the same and therefore it is an unnecessary redundancy on the Creation account. There is no redundancy, however. Gn 1:15-17 state that the light of the stars and sun are to "give light on the earth," and Gn 1:14 says that they serve as markers for "seasons, and for days and years." In contrast, the light of Gn 1:3 appears prior to the separation of the waters surrounding the earth and is not considered a seasonal marker. The primitive state of the earth in Gn 1:1-5 suggests that the light of Gn 1:3 is directed more toward distinguishing the day/night sequence for the entire cosmos, whereas the light of Gn 1:14-19 is meant specifically for the earth.[910]

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[909] In sequence, the Hebrew reads: לא־תחשך (are not darkened) השמש (the sun) והאר (and the light) והירח (and the moon) והכוכבים (and the stars). *Cf.*, Ez 32:6-8; Ps 104:2; Is 45: 7; 60:19; Br 3:33; Zc 14:6-7; 2Co 4:6; Ap 22:5; Gn 19:11; Ac 26:13. Some raise the objection that Genesis 1:14-16's assigns the moon as one of the "two lights," even though the moon merely reflects light from the sun. This can be answered by pointing out that "light" in Genesis 1:14-16 is the Hebrew *meor*, (למאודת) which can refer to a emanating body or reflecting body (*cf.* Ps 74:16; Pr 15:30).

Another objection postulates that Gn 1:14 should be translated “Let the lights in the firmament be to separate the day and night,” as opposed to the traditional reading “Let there be lights in the firmament to separate the day and night.” The argument claims that since the verb “let there be” (יהי) is not repeated before “to separate” (להבדיל) the correct meaning is that the lights of the Fourth Day were already in existence on the First Day, and their specific *task* is the focus of the Fourth Day, not their creation. As in the other objections, this one also fails to incorporate all the details of the text. The First Day had already performed the task of separating the day and the night (Gn 1:4: “...and God separated the light from the darkness”). If the sun on the Fourth Day is the light of the First Day (as the above theory postulates) the sun would have already separated day from night and thus there would be no reason for Gn 1:14 to specify that the sun was assigned this same task on the Fourth Day. The easier explanation would be that the Hebrew infinitive (“to separate”) serves to show that the action of separating day from night was already occurring in the three prior Days. In contrast, the marking of the seasons in Gn 1:14 is introduced by the finite verb “let there be” (יהי) since this represents a new function that was not present during the first three Days.

In the final analysis, any exegete who comes to the text of Genesis 1-2 claiming that the events did not happen as recorded would necessitate his showing that he possessed some kind of all-knowing perspective from which to judge the validity of the text’s propositions. If the exegete were to de-literalize every Scripture that posed an apparent conflict if read at face value, much of the Bible would become historically useless. For example, if the critiques levied against a literal interpretation of Genesis 1 were applied to the account of the plagues of Egypt in Exodus 8-10, the latter would present even more problems. Ex 9:6 records that all the cattle of Egypt died in the fifth plague, but according to Ex 9:19 more cattle were to be killed in the seventh plague. According to Ex 8:24, the insects of the fourth plague destroyed all the plants of Egypt, but in Ex 9:31 the flax and barley were destroyed in the seventh plague, while in Ex 10:15 the locusts of the eighth plague eat the remaining vegetation. It is not the prerogative of the exegete to conclude that these apparent conflicts bar a chronological reading of the text in favor of a thematic one. The exegete must carefully compare the various accounts in Scripture and work out a viable chronology, for Scripture does not err.

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[910] Analogously, the fourfold orientation of the Tabernacle resembles the first four days of creation: Ark-throne at western end equals heaven of Day One. The altar of the eastern end equals the firmament of Day Two. The table of bread at the northern end equals the plants of Day Three. The lampstand of the southern end equals the luminaries of Day Four. (See Ex 25:1-40). Moreover, the Tabernacle was made of the spoils of the Egyptians (1Ch 26:27; Nm 31). Once built, God set a “fire” on the altar (Ex 40:38; Lv 9:23-24), resembling the light of fire he set on the fourth day after the tabernacle of heaven was built. In the same way, God lit a fire at Pentecost when he rebuilt the tabernacle of David (*cf.* Ac 2:3; 15:16).

All the other apparent anomalies between Genesis 1 and Genesis 2 can be solved rather easily.[911] For now, the chronology of both chapters can be summed up as follows:

The Stars and the Speed of Light in Genesis 1

Here we will tackle one of the most common objections raised against a literal reading of Genesis 1. The objection concerns the apparent anomaly regarding the creation of the stars and speed of light. It is argued that, since it is established from modern science that the stars are very far away, so far away that light from the nearest star, *Proxima Centauri*, presently takes four years to reach the Earth as it travels 300,000 km/sec, it would have been impossible for the light from stars, which were made on the Fourth Day of creation, to reach Earth on that very day; and, in fact, *Proxima Centauri* would not have been seen until at least four years after Adam was created. It could further be argued that if the other stars are hundreds of thousands of light-years from Earth, then the age of the universe could not be anywhere close to the 6000 years that a literal reading of the biblical text demands, otherwise, we would not be seeing the light from these most distant stars today.[912]

On the surface this seems to be a very logical and worthy objection, and as a result, it has perplexed and paralyzed not a few biblical scholars. Their reactions to this apparent problem are many and varied. Some have been persuaded to abandon a literal reading of Genesis 1 altogether, or at the least, have tried to advance alternative literal renderings.[913] Some have moved to a theistic evolutionary interpretation of Genesis. Others have proposed using the time-warping principles of Special and General

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[911] Please consult the *CASB Volume IV, The Book of Genesis, Chapter 1-11*, by Robert Sungenis for further detail on this topic.

[912] A time span of 6000 years (~ 4000 B.C. to 2000 A.D.) is produced from interpreting the ancestral lines of Genesis 5 and 11 as strictly father-son relationships. See my book, *The Book of Genesis: Chapters 1-11* for a detailed study of this issue.

[913] Fr. Stanley L. Jaki, *Genesis 1 Through the Ages*, 1992.

Relativity to answer the anomaly;[914] while still others are so bothered by the anomaly that they are willing to rearrange the whole chronology of Genesis 1.[915]

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[914] In particular, D. Russell Humphreys in the book *Starlight and Time: Solving the Puzzle of Distant Starlight in a Young Universe*, Green Forest, AR, Master Books, 1994. Humphreys' bottom line is that "God used relativity to make a young universe" as he sides with what he calls "the experimentally well-established general theory of relativity." He further suggests, "the universe started as either a black hole or white hole. I suggest here that it was a black hole, and that God let gravity take its course" (pp. 128, 127, 123, quoted in order). In other words, General Relativity's dilation of time through gravity is the basis of Humphreys' theory. Hence, a clock on Earth would measure the Earth's present age as 6000 years, whereas a clock at the edge of the universe would measure 13 billion years. In essence, Humphreys uses the mathematics of General Relativity to posit that the 13 billion years commonly associated with the age of the universe is an illusion created, but allowed, by the principles of General Relativity. Ironically, however, someone else who also employed Relativity's principles came to the exact opposite opinion of Humphreys, which is not surprising, since in Relativity everything is "relative" (G. L. Schroeder, "The Universe – 6 Days and 13 Billion Years Old," *Jerusalem Post*, September 7, 1991). Humphreys can have little argument against it since according to General Relativity, a person standing at the edge of the universe would think that his immediate vicinity is 6000 years old and the Earth is 13 billion.

[915] In particular, Gorman Gray in the book *The Age of the Universe: What are the Biblical Limits?*" Washington, Morning Star Publications, 2005, in which he argues that the clause in Gn 1:1, "In the beginning God created the heavens," denotes that at that time the sun and the stars must have been created, and that the text allows for an indefinite time-gap between the appearance of the stars/sun and the creation of the Earth. During this "indefinite time," starlight is said to be traveling to Earth and, based on a speed of 186,000 miles per second, would have had enough time to make the multi-million year journey. To substantiate this interpretation, Gray further argues that the Hebrew עשה (*asah*) appearing in Genesis 1:16 and normally translated "made" really means "brought forth," such that the light of the sun and stars is now allowed to penetrate to Earth, having previously been obscured by a "cloud of thick darkness" (*cf.* Jb 38:9) that has since been removed. This is similar to the view propounded by Hugh Ross (see Volume 3, Chapter 15 of *Galileo Was Wrong:The Church Was Right*), yet it must be rejected for the same reasons. There is absolutely no indication in the Genesis text that stars were created before the Earth, and it is likewise exegetically presumptuous to limit the definition of Gn 1:1's "heavens" to the existence of stars in the heavens as opposed to the heavens itself. According to Gn 1:14-16, the sun and stars are placed "in the heavens," that is, they are not *the* heavens but are attached to the heavens. The Hebrew phrase is מארת ברקיצ השמים which translates as "lights in the firmament of the heavens," with the preposition "in" denoted by the consonant "ב" prefixing the word רקיצ "firmament." This phrase is

At the outset we must note that it makes little difference if one bases his argument on the idea that the stars are billions of light years or just four light years from Earth. In either case, if the speed of light is given an unchanging value of 300,000 km/sec, yet it is agreed that when the stars were created on the Fourth day an observer on Earth would have seen their light immediately, then the light of the stars must have reached Earth either instantaneously or sometime before the close of the Fourth day. Even if we give light an extra day or two to arrive on Earth such that it would have appeared on the Fifth or Sixth days of creation, this does not provide an adequate solution to the problem, since the nearest star is, at least according to modern astronomy, four light years away. As such, the light from *Proxima Centauri* would have arrived four years after Adam was created, and light from stars that are farther away than 6,000 light years would not yet have reached the Earth, according to the biblical timetable.

One counterargument is that after the stars are mentioned in Gn 1:16, they are not mentioned again in the biblical text until Gn 15:5, when God tells Abraham to look up at the stars and count them. The time period between Gn 1:16 and Gn 15:5 would allow star light to travel for the whole time from the creation week to the time of Abraham's old age. As such, the total time of travel could have been two thousand years (4,000 B.C. to 2,000 B.C.). If we assume light's speed has always been the same, then, at the maximum, the total miles traveled would have been 3.5×10^{16} miles in 6,000 years, or 3.5 quadrillion miles. This distance could accommodate quite a few stars in the universe. In fact, it would more than satisfy the only empirical method of determining the distance to the stars,

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repeated in Gn 1:17 ("And God set them in the firmament of the heavens") with the addition of the word נתן ("set") to reinforce that the sun and stars are distinct from the firmament in which they are set. In addition, there is no "firmament" on the first day of creation, there is only the heavens that are filled with the water surrounding the Earth, and as such, the heavens waiting to be refilled by both the firmament and the celestial bodies, on the Second and Fourth Days, respectively. Moreover, Gray's contention that "brought forth" is a clearer translation than "made" of the Hebrew *asah* is untenable. Although *asah* has some variation in its contextual meaning, when it appears in creation contexts, its meaning is closer to "made" than it is to "brought forth." For example, Psalm 33:6 [32:6] states: "By the word of the Lord the heavens were *made* [asah], and by the breath of His mouth all their host." Here *asah* is used in the almost identical wording that appears in Gn 1:1 ("In the beginning God *created* the heavens…") although in that case the Hebrew ברא (*bara*) is used instead of *asah*, which shows that the words are exegetically interchangeable.

namely, stellar parallax, which, beyond 100 parsecs or 1.92 quadrillion miles, cannot be applied as an accurate means of measuring distance.

It could further be argued that the alternative and more common method of measuring the distance to the stars beyond the limits of parallax, that is, the redshift of light, is simply an unproven scientific hypothesis that remains in the throes of controversy, and therefore no biblical scholar is required to accept or apply a redshift/distance relationship as an irrefutable scientific fact. Modern scientists are not even sure what light is or how it travels.

Two astrophysicists have proposed a mathematical model for a much shorter travel time for light in the universe. Parry Moon of M.I.T. and Domina Spencer of the University of Connecticut introduced the idea in a paper titled "Binary Stars and the Velocity of Light." The authors state:

> The acceptance of Riemannian space allows us to reject Einstein's relativity and to keep all the ordinary ideas of time and all the ideas of Euclidean space out to a distance of a few light years. Astronomical space remains Euclidean for material bodies, but light is considered to travel in Riemannian space. *In this way the time required for light to reach us from the most distant stars is only 15 years.*[916]

The problem with all the above proposals, however, is that they will not allow light from the stars to appear on Earth on precisely the Fourth day of creation, yet the text of Genesis insists the opposite is true since the stars are included among the celestial bodies given the task of time-keeping (Gn 1:14: "and let them be for signs and for seasons and for days and years"; Gn 1:18: "and to govern the day and the night"). We know the stars' role in time keeping today as "sidereal time," and it is an essential ingredient in chronology for it allows us to have a contrasting background in order to measure the sun's path around the Earth. So precise is this star/sun relationship that the sidereal day is always 4 minutes and 56 second shorter in length than that which we keep by the sun on a 24-hour-per-day clock.

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[916] Parry Moon and Domina Spencer, "Binary Stars and the Velocity of Light," *Journal of the Optical Society of America*, Vol. 43, No. 8, August 1953, p. 635, emphasis added. By an exhaustive study of the binaries, Moon and Spencer concluded: "Velocity of light in free space is always c with respect to the source, and has a value for the observer which depends on the relative velocity of source and observer. True Galilean relativity is preserved, as in Newtonian gravitation" (*ibid.*, p. 641). Perry Phillips has critiqued Moon and Spencer's proposal in "A History and Analysis of the 15.7 Light-Year Universe," American Scientific Affiliation, 40.1:19-23(3/1988).

Although we are not compelled to include distances beyond 100 parsecs, still, since there certainly could be stars that are farther away than the limits our present parallax capabilities can judge, we look to additional solutions to the starlight problem. In other words, if there is a star beyond the round figure of 6,000 light years away from Earth, biblical chronology (at least based on an unchanging speed of light) seems to have no way of explaining how that star's light reached Earth during the Earth's biblical time of existence.

In searching for a solution, we must keep two things in mind:

(1) We must never discount the possibility that the stars could have been created many thousands of light years from the Earth and their light could have been brought to Earth instantaneously by an act of creative fiat. It would certainly be illogical to argue, on the one hand, that God created the stars instantaneously, but then argue, on the other hand, that He could not perform a creative miracle and allow their light to stretch instantaneously to the Earth. If one accepts a divine intrusion for the former, on what basis can he deny it for the latter? God himself determines the boundary line for how and when His miraculous intrusion ceases and natural processes take over. None of us can set arbitrary limits on when the crossover should take place, especially in the very beginnings of creation when most events are dependent on God's miraculous direction. One of the main reasons that modern atheistic science believes the universe is 13.7 billion years old is that it denies a creative fiat *at any time*, insisting that everything, from the appearances of matter to starlight, respectively, must occur by natural processes. At some point, the biblicist must deny the premise of naturalism, whether he decides to do so on the Fourth Day of creation or at the so-called Big Bang, for even the most liberal-minded biblical scholar knows that something cannot come from nothing. Hence, it is no great stretch for the conservative biblicist to include the creative fiat not only of the stars themselves but also of the light intervening between them and the earth.

(2) After we recognize that God could have made starlight appear on Earth miraculously, other biblicists may feel compelled to at least offer some naturalistic explanation for the starlight's reaching Earth, if for no other reason than to cover all the bases and convince the opponent that there is no escape for those looking for a more naturalistic approach to Genesis 1 (*e.g.*, evolutionists). As such, we refer ourselves to the events of the Second Day of creation, when God created the firmament. The firmament includes both the expanse of space to the limits of the universe

(Gn 1:6-9, 14-19) as well as the space in the immediate vicinity of Earth in which "the birds fly" (Gn 1:20). The Hebrew word רקיע *raqia* (firmament) denotes something hard and dense like metal but it also describes something ethereal and penetrable. Fitting the firmament between those two extremes means that we have a truly amazing substance in our universe. The best way to incorporate the two extremes is to understand the firmament as an extremely fine yet dense particulate substance that is frictionless and which permeates every part of the universe and constitutes its vast internal substructure.

Scripture speaks of the firmament being transformed from its original dimensions to an "expanded" state. For example, Psalm 104:2 says that God is "stretching out heaven like a curtain." Depending on the Hebrew passage cited, the expansion of the firmament is an event that: (a) occurred once in the past; (b) occurred in the past but was also a progressive event for a certain period of time; or (c) occurred in the past and is still continuing.[917] Of these grammatical possibilities, the scientific evidence shows that either (a) or (b) is correct since (c) would require that the galaxies must expand at the same rate as the space between them expands, but we do not see that phenomena in today's astronomical data. Big Bang cosmologists who believe the universe is expanding do not have a good explanation for why the galaxies themselves are not also expanding.[918]

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[917] Based on the stipulation in Gn 1:8 that "God called the firmament heaven," the term "heaven" is often interchangeable with "firmament." In regard to the "expansion," Jb 9:8 contains the Qal participle נטה which can refer to a progressive "stretching out," and matches the progressive speech in the preceding verse: "the One speaking to the sun, and it does not rise and to the stars he sets a seal." The same Qal participle appears in Ps 104:2 and Is 42:5 in a similar context of progressive action, whereas Is 44:24 uses the same Qal participle but could refer to a single act or a progressive action. Isaiah 45:12 uses the Qal perfect נטו referring to a past act, as does Jr 51:15. In Is 51:13 the Qal participle is coupled with a past act ("founded the Earth"), yet Zc 12:1 uses the Qal participle coupled with two other Qal participles ("founding the Earth" and "forms the spirit of man within him," the latter of which is a continuing action). All in all, the evidence leans towards the "stretching out" as an event with a definitive beginning in the past but in continual progress, at least for some indefinite period of time, and thus a process that did not cease on Day Two of creation week.

[918] For example, Stephen Hawking states: "It is important to realize that the expansion of space does not affect the size of material objects such as galaxies, stars, apples, atoms, or other objects held together by some sort of force. For example, if we circled a cluster of galaxies on the balloon, that circle would not expand as the balloon expanded. Rather, because the galaxies are bound by gravitational forces, the circle and the galaxies within it would keep their size and configuration as the balloon enlarged. This is important because we can detect

Additionally, if, as modern cosmology believes, the speed of gravity is limited to the speed of light (3×10^8 km/sec), a universe expanding faster than the speed of light would have no gravity in most of its expansion area.

Back to Genesis. The first question regarding the expansion concerns how fast it occurred. Since the sun and stars were placed "in the firmament of the heavens," the firmament would need to be big enough at the dawn of the Fourth Day to house the sun and all the stars. As the celestial bodies were placed in the firmament, it would have continued to expand away from the Earth, and in the process it would have carried the stars with it to the outer-most recesses of the universe.

If, for the sake of argument, we limit the speed of light to 186,000 miles per second ($= 3 \times 10^8$ km/sec) at the time the stars are placed in the firmament, and also limit ourselves to affirming that their light reached Earth on the Fourth Day, this means that the size of the firmament at the end of its expansion on the Fourth Day would be no bigger than the allowable distance light could travel in 24 hours (*i.e.*, the 24 hours from the beginning of the Fourth day to the end of the Fourth day). As such, the radius of the firmament would have been no bigger than 1.6×10^{10} miles (or 16 billion miles); and its volume would have been 1.256×10^{31} cubic miles. If, as we will postulate momentarily, the celestial speed of light is much faster than its terrestrial speed, the volume into which the stars and galaxies would fit on the Fourth Day is very much bigger than a 16 billion mile radius.

Within the distance of 16 billion miles, the light from the stars travels to Earth in a period of 24 hours or less. As such, we have satisfied the objection concerning how starlight could appear on Earth on the Fourth Day of creation. All that is needed now is to add the subsequent events. Consequently, as the starlight reaches Earth on the Fourth Day, the expansion of the firmament continues. The rate of expansion could then be

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expansion only if our measuring instruments have fixed sizes. If everything were free to expand, then we, our yardsticks, our laboratories, and so on would all expand proportionately and we would not notice any difference" (*The Grand Design*, 2010, pp. 125-126). This is little more than a special pleading. Hawking is admitting that he must limit the expansion to the space outside of matter instead of including the space inside of matter, otherwise his Big Bang will not work. But if the gravity of a single galaxy can stop the space within it from expanding, why doesn't the combined gravity of all the universe's galaxies stop the space in the universe from expanding? The Big Bang allows the expansion of the universe's space to overtake gravity for billions of years, yet it doesn't allow this same expansion to overtake the gravity of a single galaxy for any length of time. This is much too convenient. It shows once again how Big Bang theorists fudge their numbers to make it appear to work.

accelerated in order to arrive at the size the universe is today. In any case, the expansion will cease once the universe reaches it optimal size, but we do not know when that termination point occurs. As the firmament continues to expand beyond the radius of the Fourth Day it will carry the newly created stars with it. The major point is made that, within the context of the expanding firmament, the Bible places no limitations on starlight reaching Earth on the Fourth Day.

Some might venture to say that a rapidly expanding universe would later cause havoc with today's redshift values. That might only be true if redshift is proven to be an indicator of velocity and distance, but even then, modern cosmology does not see a problem with redshift values.[919] Today, all indications are that redshift is being touted as a velocity indicator merely because that particular interpretation is required of the expansion needed for the Big Bang theory. In fact, the discoverer of redshift, Edwin Hubble, originally rejected that redshift is a measure of velocity. Since the time of Hubble, a 2010 paper by Louis Marmet catalogues sixty different theories for the cause of redshift.[920] One of the more challenging hypotheses for redshift is that it represents the energy level of the source of the light rather than the energy level after the light leaves the source and is disturbed by the environment. Astronomer Halton Arp has shown convincing evidence that redshifts are intrinsic to the object emitting the radiation and thus cannot be indicators of velocity or expansion of the universe.[921] Corroboration for Arp comes from a recent paper by C. S. Chen, *et al*, in which it was found that “redshifts of spectral lines…are influenced by electron density.” More specifically, Chen found that

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[919] As Hartnett notes: "The expansion redshift is the redshift that according to General Relativity results from the stretching of space itself and is usually defined by $R_0/R = 1 + z$, where R_0 is the scale factor of the universe now, and R at some time in the past. According to the Friedmann-Lemaître solution of Einstein's field equations, the expansion redshift only depends on the scale factor of the universe at the time the light was emitted and the time it was received. The fabric of space itself stretches between emission and reception. This is what is usually referred to as Hubble flow. The expansion redshift doesn't depend on the rate of this expansion" (John G. Harnett, "Is there any evidence for a change in c?: Implications for creationist cosmology," *Technical Journal* 16(3) 2002, pp. 91-92).

[920] "On the Interpretation of Redshift: A Quantitative Comparison of Red-shift Mechanisms," Louis Marmet, Dec. 3, 2011. His abstract states: "This paper gives a compilation of physical mechanisms producing red-shifts of astronomical objects. Over sixty proposed mechanisms are listed here for the purpose of quantitative comparisons." See also "A review of redshift and its interpretation in cosmology and astrophysics," R. Gray and J. Dunning-Davies, June 2088, Dept. of Physics, Univ. of Hull, England.

[921] Arp has shown, for example, that high redshift quasars are attached to low redshift galaxies, thus showing that redshift cannot be due solely to velocity or

> when the electron density increases, the difference of the atomic energy level is reduced, and then the redshift is raised. The Hg atomic levels embedded in a density environment are influenced by the free electrons density. The electronic fields generating from free electrons compressed inside an atom screen the Coulomb potential of the atomic nuclear. Then the nucleus’ forces to the bound electrons are diminished, while the repulsion of free to bound electrons are raised and the intervals of excited energy levels $7s^3S$ to $6p^3P_1^0$ are diminished. Accordingly, the increase in density will have a substantial impact on redshifts – that is, the shielding to a nucleas is intensified by the strengthened electric field, then the attraction of the nucleus to its bound electrons is declined, followed by the decrease of energy level differences and redshifts.[922]

Interestingly enough, Hubble found that a non-velocity interpretation of redshift would also nullify Special and General Relativity. As he puts it:

> On the other hand, if the recession factor is dropped, if redshifts are not primarily velocity-shifts, the picture is simple and plausible. There is no evidence of expansion and no restriction of the time-scale, no trace of spatial curvature, and no limitation of spatial dimensions.[923]

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distance. See chapter 8 in this volume for detailed information on Arp’s work and the ostracizing he has received for it from the Big Bang establishment. Arp proposes that quasars have an intrinsic red shift because they are surrounded by a cloud of electrons, which produces a red shift when light travels through it since the light loses energy to the electrons by means of the Compton Effect. Hence quasars may be much nearer to us than reported by Big Bang cosmology and, in fact, they have exhibited proper motion.

[922] “Investigation of the mechanism of spectral emission and redshifts of atomic line in laser-induced plasmas,” C. S. Chen, X. L. Zhou, B. Y. Man, Y.Q. Zhang, J. Guo, College of Physics and Electronics, Shandong Normal University, Jinan 250014, PR China, accepted 1 Dec. 2007, p. 477.

[923] *The Observational Approach to Cosmology*, p. 63. See more on Hubble’s analysis in chapter 8.

Distant Events: Are They Past or Present?

Some people object that celestial events observed on Earth, such as a distant supernova, happened a very long time ago but are now just being seen on Earth. In other words, we have the problem of determining whether the event occurred in real time (Earth time) or thousands or millions of years ago (*i.e.*, the length of time it would take light from the supernova to reach Earth). If the latter is true, then the universe must be much older than the 6000 years allowed by a strict biblical timetable. This objection is based on the supposition that the speed of light cannot exceed 3×10^8 km/sec. This speed, normally designated c in mathematical equations, is a postulate of the Special Theory of Relativity, but by no means is it a proven scientific fact. As we will see in stark detail in Chapter 4, Albert Einstein limited light's speed based on his particular interpretation of the Michelson-Morley experiment and Maxwell's equations, but his interpretation was not only biased against geocentrism, it was based only on the terrestrially tested speed of light. The speed of light outside our immediate environment has never been tested or proven to be limited to 3×10^8 km/sec.

Quite ironic is the fact that later in his career Einstein himself admitted to an unlimited celestial light speed ten years after he claimed it was constant. He writes:

> In the second place our result shows that, according to the general theory of relativity, the law of the constancy of the velocity of light *in vacuo*, which constitutes one of the two fundamental assumptions in the special theory of relativity and to which we have already frequently referred, cannot claim any unlimited validity. A curvature of rays of light can only take place when the velocity of propagation of light varies with position. Now we might think that as a consequence of this, the special theory of relativity and with it the whole theory of relativity would be laid in the dust. But in reality this is not the case. We can only conclude that the special theory of relativity cannot claim an unlimited domain of validity; its results hold only so long as we are able to disregard the influences of gravitational fields on the phenomena (*e.g.*, of light).[924]

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[924] Albert Einstein, *Relativity: The Special and the General Theory*, translation by Robert W. Lawson, 1961, p. 85.

This begs the question as to how much "gravitational fields" can affect the speed of light. A popular book on Relativity provides an answer.

> If gravitational fields are present the velocities of either material bodies or of *light can assume any numerical value* depending on the strength of the gravitational field. If one considers the rotating roundabout [earth] as being at rest, the centrifugal gravitational field assumes enormous values at large distances, and it is consistent with the theory of General Relativity for the velocities of distant bodies to exceed 3×10^8 m/sec under these conditions.[925]

In the geocentric system, a diurnally rotating universe creates tremendous centrifugal forces which, according to Einstein's own covariance equations, are equivalent to the force of gravity. As such, light traveling in this kind of superdynamic environment can easily exceed 3×10^8 m/sec. As Rosser notes "light can assume *any numerical value* depending on the strength of the…centrifugal gravitational field" which has "enormous values at large distances." In the Planck-ether medium of geocentrism, the speed of a transverse wave, such as light, depends on the tension between the Planck particles.[926] The greater the centrifugal force, the greater the tension and thus the greater the speed of light. The inertial force of a rotating universe increases as the distance from the center of mass increases. Consequently, the farther from Earth a star is in a rotating universe, the faster its light can travel toward Earth, the center of the universe. By the time the light reaches the environs of Earth, however, it will be traveling at the minimum speed of 3×10^8 m/sec since the surface of the Earth is at or near the neutral point of all the inertial forces created in a rotating universe. Outside of this locale, light can travel at much greater speeds than 3×10^8 m/sec. Since that is the case, we may be looking at the explosion of supernovae precisely when they occur in deep space.

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[925] *An Introduction to the Theory of Relativity*, William G. V. Rosser, 1964, p. 460, emphasis added. Einstein was criticized on this very point by Philip Lenard in a 1917 open debate, later published in 1920. Lenard stated: "Superluminal velocities seem really to create a difficulty for the principle of relativity; given that they arise in relation to an arbitrary body, as soon as they are attributed not to the body, but to the whole world, something which the principle of relativity in its simplest and heretofore existing form allows as equivalent" ("Allgemeine Diskussion über Relativitätstheorie," *Physikalische Zeitschrift*, 1920, pp. 666-668, cited in Kostro's *Einstein and the Ether*, p. 87). Rosser notes that "It has often been suggested that a direct experimental check of the principle of the constancy of the velocity of light is impossible, since one would have to assume it to be true to synchronize the spatially separated clocks" (p. 133). Rosser also adds a note on the viability of the geocentric universe: "Relative to an inertial frame the 'fixed' stars are at rest or moving with uniform velocity. However, relative to a reference frame accelerating relative to an inertial frame the stars are accelerating. It is quite feasible that accelerating masses give different gravitational forces from the gravitational forces due to the same masses when they are moving with uniform velocity. Thus the conditions in an accelerating reference frame are different from the conditions in inertial frames, since the stars are accelerating relative to the accelerating reference frame. It seems plausible to try to interpret inertial forces as gravitational forces due to the accelerations of the stars relative to the reference frame chosen" (p. 460).

We can grasp this phenomenon intuitively by illustrating the stretching of a metal spring. If we hit the end of an unstretched spring, the vibration will travel to the other end of the spring in a certain time and velocity. If we stretch the spring to about three times its original length, the vibration will travel proportionately faster due to the increased tension in the spring.[927] If we whirled the spring around in a circle, the centrifugal force stretches the spring. Similarly, a rotating universe stretches the ether medium within it. The greater the radius of the rotation, the greater the centrifugal force, and thus the greater the tension in the ether medium. This will result in a greater speed for light traveling through that medium. For example, if at a certain distance away from Earth the tension of the ether is 100 times greater than it is near the Earth, this will increase the speed of light by $\sqrt{100}$ or 10 times c. If the tension is 1,000,000 times greater, the speed of light will increase to $\sqrt{1{,}000{,}000}$, or 1,000 times c.

For illustration purposes, let's use a star, Alpha Centauri, that astronomers believe is "four light years" (or 23.2 trillion miles) from Earth.[928] According to the above equation, in order for light from Alpha

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[926] http://en.wikipedia.org/wiki/Planck_particle.

[927] The equation for determining the velocity of the vibration is $v = \sqrt{T/\mu}$ where v is the velocity of the vibration, T is the tension of the spring and μ is the mass of the spring divided by its length.

[928] With the advent of the Hipparcos satellite launched in 1989 by the European Space Agency, its telescopes gathered 3.5 years worth of data on stellar positions and magnitudes, which were eventually published in 1997. Viewing the stars through two telescopes 58 degrees apart, Hipparcos measured the parallax of 118,000 selected stars within an accuracy of 0.001 seconds of arc. This accuracy is comparable to viewing a baseball in Los Angeles from a telescope in New York. Another mission, named Tycho (after Tycho de Brahe) measured the parallax of a million stars, but only to an accuracy of 0.01 seconds of arc. As accurate as these measurements appear to be, the reality is, beyond 100 light

Centauri to reach Earth in one day, the light needs to travel at 4,508 × 10^8 m/sec, which is 1,502 times greater than *c*. This would require a tension of $\sqrt{2,256,004}$. Are such tensions possible? Yes, indeed. In fact, a Planck-ether medium could sustain tensions that are millions of orders of magnitude greater. Although the Planck-ether, at 1.61 × 10^{-33} cm per particle, is incompressible, it can be stretched to very great dimensions and remain completely stable. But since it is so strong, it would take a tremendous amount of centrifugal force to stretch it. To measure the centrifugal force (CF) of a rotating universe, the equation is $CF_{\text{newtons}} = mv^2/r$. For the distance from Earth to the distance between Alpha Centauri and the maximum for stars measured by stellar parallax, the centrifugal force is about 10^{68} to 10^{69} newtons; and proportionately different for stars at greater distances. Interestingly enough, using the $v = \sqrt{T/\mu}$ equation for tension, to increase *c* ten orders of magnitude (3 × 10^{16} m/sec), it would require *T* to be 10^{61} or so.[929] We note here, however, that it is not the stars themselves that are experiencing centrifugal force since such inertial forces are only induced if the rotation is with respect to the gravitational or inertial field. In this case, it is the Planck medium that contains the gravitational or inertial field, and it carries that field in its rotation. Only if the stars were rotating independently of the Planck medium would they experience centrifugal force. In fact, the Planck medium has such high granularity that it does not interact with baryonic matter. It only reacts with electromagnetic and gravitational activity. Local phenomenon, however, such as binary stars or moons circling planets, experience local inertial forces due to the dynamics of a two+ body model.

Other Attempts to Solve the Star Light Problem

Along these lines of argument we must also point out that other scientific biblicists who have tried to find a solution to the starlight problem have been unsuccessful because they have rejected the geocentric universe. For example, John G. Hartnett, a physicist from the University of

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years, it is hardly possible to measure an accurate parallax. Even within 20 light-years, parallax measurements are accurate only to within one light-year. At 50 light-years from Earth the error could be as high as 5-10 light-years in distance. All in all, within a 10% margin of error, Hipparcos measured the parallaxes of about 28,000 stars of up to 300 light-years from Earth. For any star beyond 300 light years, scientists are forced to estimate its distance from Earth by other means, none of which are proven methods of measurement (e.g., redshift).

[929] A Planck particle has a mass of 2.2 × 10^{-5} grams over a length of 1.6 × 10^{-33} centimeters, giving a value for μ of 1.375 × 10^{28} gm/cm.

Western Australia, outlines the possible solutions for the starlight problem as follows: (1) “the language of Genesis is phenomenological…stars were made millions and billions of years before Day 4, but…the light…arrived at the Earth on Day 4”; (2) “clocks in the cosmos in the past have run at much higher rates than clocks on Earth”; (3) “clocks on Earth in the past have run at much slower rates than clocks in the cosmos”; (4) “the speed of light was enormously faster in the past, of the order of $10^{11}c$ to $10^{12}c$”; (5) “the Creator God revealed in the Bible is a God of miracles.” We can add (6) to the above, since Harnett also includes Russell Humphreys’ “White-hole cosmology,” which says that “due to gravitational time dilation, clocks on Earth near the centre of this spherically-symmetric bounded and finite distribution of matter ran slower than clocks throughout the cosmos.” In another paper, Hartnett highlights the new theory (7) of Jason Lisle, which holds that “the stars really were made on the fourth day of Creation Week, and that their light reached Earth instantaneously due to the way clocks are synchronized.” Known as the Anisotropic Synchrony Convention model, it holds that “in a galaxy far, far away, the biblical text must mean that the first four days occurred, in our usual way of thinking about time, a long, long time ago” so that “the most distant galaxies were first created tens of billions of years before the first day of creation of Genesis 1, and subsequently created closer and closer towards Earth at the constant speed of light *c* such that the light from all the galaxies arrived at the earth on the fourth day, for the first time.”[930]

Harnett finds flaws in each of these proposals and then offers his own, which is a variation of #3. We will call it (3a). He states:

> During Creation Week, all clocks on Earth, at least up to Day 4, ran about 10^{-13} times the rate of astronomical clocks….During this time the rotation speed of the newly created Earth was about 10^{-13} times the current rotation speed as measured by astronomical clocks, but normal by Earth clocks. By the close of Day 4 the clock rates on Earth rapidly speeded up to the same rate as the astronomical clocks. All of this was maintained under God’s creative power before He allowed the laws of physics to operate ‘on their own’ at the end of Creation Week.[931]

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[930] “The Anisotropic Synchrony Convention model as a solution to the creationist starlight-travel-time problem,” John G. Hartnett, *Journal of Creation* 25(3) 2011, p. 56.

[931] “A new cosmology: solution to the starlight travel time problem,” John G. Hartnett, *Technical Journal* 17(2) 2003, pp. 99-100. Hartnett notes that Humphreys’ model (#3, which uses relativistic time dilation), and by implication Hartnett’s own model which is a variation of Humphreys’, “requires that the

The common factor in most of these models (except #4) is that time is understood to be flexible. Since in these scenarios time is understood as a calibration of the interval between one event and another, then it can change depending on one's point of view of the interval. The opposite concept (and the one that Newton maintained) is that time is absolute and does not change due to different methods of calibration or points of view. Essentially, as time is understood as merely a calibration issue, the more pliable it becomes. The real prize, however is that making time flexible allows one to abide by Einstein's postulate of Special Relativity that the speed of light always remains *c* (300,000 km/sec), and thus the theory will be more acceptable by mainstream science.

In addition to making time flexible, some of the theories make the text of Genesis flexible. They do so by claiming that the stars were made millions or billions of years before the Creation began in Genesis 1:1. Their light, then, has time to travel at speed *c* and reach the Earth millions or billions of years later. Obviously, this theory alters the Genesis account by having the stars created before the events of Genesis 1 instead of on Day Four of Genesis 1.

Recapping the theories we have:

View	**Time**	***c* speed**	**Genesis**
#1	Altered	Fixed	Altered
#2	Altered	Fixed	Same
#3	Altered	Fixed	Same
#3a	Altered	Fixed	Same
#4	Fixed	Altered	Same
#5	Altered	Fixed	Same
#6	Altered	Fixed	Same
#7	Altered	Fixed	Altered

As noted, the problem with these theories is the assumption that time is malleable since its calibration is assumed to be dependent on one's point of view, a principle stemming from Einstein's principle of relativity.

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universe have a preferred frame of reference. There is evidence that this is the case and it appears the Earth is actually near the centre of the universe" and supports this galacto-centric model by quoting from Humphreys' paper, "Our galaxy is the centre of the universe, 'quantized redshifts show" (*Technical Journal* 16(2):95-104, 2002).

Theory #4 is the only one that alters the speed of light, but it does so based on the supposition that light's speed has been steadily decaying since Creation and has presently reached its lowest level of 3×10^8 km/sec.[932] Conversely, our theory proposes that the speed of light is 3×10^8 km/sec only in the environs of Earth, but is many orders of magnitude greater in the recesses of space due to the centrifugal force generated by a rotating universe. As such, only a geocentric system can explain the starlight problem of Genesis, while the failure of each of the above theories stems from their opposition to geocentrism.

Using the Redshift Formula for a Small Universe

In regard to the redshift, it is interesting to see what happens when we use Big Bang cosmology's very own formula for measuring the age of distant objects. The age is calculated by the formula $t = t_0 (1 + z)^{-3/2}$, where t_0 is the current age of the universe and z is the redshift factor of the object.[933] Most of modern science believes the universe began during a Big Bang, and using their own assumptions and scale factors, it believes that this seminal event occurred 13.7 billion years ago, at least according to the latest data from NASA's Wilkinson Microwave Anisotropy Probe. Let's say NASA finds a distant object in the sky and assigns it a z-factor of 1. NASA will then plug in the value for t_0 as 13.7 billion years and will compute a value for t, which is understood as the age of the universe when the radiation emission of the distant celestial object took place. In the case where $z = 1$ then $t = 4{,}844{,}413{,}013$ years. Since using the number 13.7 billion years is completely arbitrary (for it is based on the unproven Big Bang assumptions of the universe), let's say we assume t_0 is 10,000 years instead of 13.7 billion. In this case, where $z = 1$ then $t = 3{,}536$ years. In other words, when an astronomer sees a star with a z-factor of 1, he might just as well assume the universe was 3,536 years old rather than 4.8 billion years old, since the z-factor is only a function of one's assumption regarding the beginning of the universe. If an astronomer finds an even more distant object that correlates to a z factor of 2, then the age of the universe when the object began radiating was 1,924 on the biblical scale but 2.6 billion years on the Big Bang scale.

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[932] According to Hartnett, there is no justifiable evidence for this theory, which is held by Setterfield and Norman (http://www.youtube.com/watch?v=xjqxvpFn-Gs&feature=related and http://www.youtube.com/watch?v=uU5YB4E-GXU&feature=relmfu). Hartnett critiques the theory in "Is there any evidence for a change in *c*?: Implications for creationist cosmology," *Technical Journal* 16(3) 2002, pp. 89-94.

[933] This z-factor formula is based on the so-called "dust model" of the universe wherein the major components of the universe do not exert any pressure on their surroundings. But if one were to base the z-factor on the radiation of the CMB in terms of number of particles, the formula would be $t = t_0 (1 + z)^{-2}$. This again, shows the complete arbitrariness of the formulas since they invariably depend on one's unproven assumptions.

Of course, the biblicist does not interpret either the 3,536 years or 1,924 years as the different times that two stars were created, for he holds, on a dogmatic basis, that all the stars were created on the same day. It only means that, as the firmament expanded and carried the variously placed stars within it, their wavelength would be stretched by their medium, the firmament, in proportion to the distance they were originally placed from Earth. (See 1Co 15:41, which teaches that "star differs from star in glory," presumably because of their specific composition and purpose, which required them to be placed at different distances from the Earth). Thus, if we were to understand redshift as a distance indicator, what we see as differences in redshift values today is merely the result of the differences of the original placement of the stars on the Fourth day of creation. The stars that were placed closer to Earth will now exhibit lower redshift values today, and vice-versa for the stars placed farther away.

Interestingly enough, if we use modern science's formula for measuring the age of the universe when the cosmic microwave background radiation (CMB) was released, we get very close to the time we have predicted that the firmament would create the 2.73° Kelvin temperature. The formula is $T = T_0 (1 + z)$. Plugging in a z-factor of 1089 for the CMB, the Big Bang theory arrives at a universe age of 380,711 years after the primordial explosion for the arrival of the CMB, whereas using the same z-factor the biblicist obtains 0.278 years, which puts the CMB well within the first three months of the first year of creation and after the fall of man when, as we saw earlier, according to Hildegard, the universe began rotating and the firmament needed to be cooled at 2.73° Kelvin.

A Critique of Fernand Crombette

As noted previously, our work accepts as a starting point the ecclesiastical decisions made by Catholic papal authorities in the Galileo case who rejected as "formally heretical," "erroneous in faith," and "opposed to Scripture" the diurnal and translational motion of the Earth (*i.e.*, that the Earth spins on an axis and revolves around the sun). As such, there are severe problems with the geocentric theory once proposed by Fernand Crombette (1880-1970) and, unfortunately, the same theory that is being advanced by the French "CESHE" group (Cercle Scientifique et Historique). Although Crombette believed that Earth was centrally located in the universe, he also held to many ideas that have little or no scriptural, ecclesiastical, traditional or scientific support.

Crombette held to the following problematic concepts:

- the Earth rotates on an axis every 24-hours.
- the Earth rotates around a universal axis once per year.
- there is a "very large and heavy planet" outside the orbit of Pluto.
- the Earth moves through space at the "pace of a man walking" (supposedly coinciding with the small positive result of the 1887 Michelson-Morley experiment).
- at the beginning of creation, the Earth was in the sun and was then pulled out of the sun.
- the moon was pulled out of the Earth.
- in order to arrive at this cosmological knowledge we must read Scripture by transposing the Hebrew into Coptic sounds.[934]

The last of these suppositions, namely, that the Hebrew Scripture must be read by retranslating into Coptic sounds in order to get to the real truth of the text is an unproven, subjective and perhaps a very serious breach of scriptural exegetical principles. Crombette based many of his interpretations on his Coptic retranslations and it seems to be the principle reason he went off the track in regard to understanding the cosmological order. We are somewhat chagrined at his approach and conclusions since no one in all of Christian history has advocated, even remotely, the cosmological views that Crombette espoused, and there was good reason: there was simply no evidence for it. Although Crombette did a lot of other valuable work, CESHE's indiscriminate support of Crombette's cosmology needs to be reassessed, especially since CESHE makes no claims of knowing Coptic, Hebrew, or Greek, nor to the art of bible translation and the science of manuscript transmission, all of which are absolutely essential in determining the veracity of Crombette's claims.

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[934] Cromette states: "…the Hebrew Bible could – and should – be read by giving to the Hebrew letters their Coptic sound" (Noël Derose, *If the World Only Knew: Fernand Crombette, His Life and Work*, C.E.S.H.E., BP 1055, 59011 Lille Cedex, France, 1996, p. 65, and also stated on p. 192). On page 235 it is stated that Crombette, after taking "from the Hebrew text in Vigouroux's Polyglot Bible, he retranslated…basing his reading of the Hebrew letters on their value in the Coptic language, which was that spoken by Moses. Coptic was the language spoken in Egypt, where the Hebrews were living at that time." See also pages 244, 249, 295-314, 331, 334-335, 348.

The most glaring problem with Crombette's approach is his almost total dependence on his arbitrary decision to use Coptic as the basis for translating and understanding the Hebrew text, which by his own admission are vastly different than the accepted Hebrew translations of today, especially in the crucial texts of Genesis 1-2. Even the Coptic versions of Scripture were not its main translations, the language being confined as it was to small regions of Egypt. The commonly used Coptic manuscripts (*e.g.*, the Bohairic, the Sahidic, and the Memphite) disagree among themselves, as well as being saddled with the same discrepancies when compared to the more common Hebrew Masoretic texts, the Septuagint versions, and the Greek New Testament codices. The worst part of Crombette's unsubstantiated methodology is it is foisted upon some of the most important passages in Scripture – those dealing with the beginning of creation.

Turning to the details, in Crombette's Coptic retranslation of Genesis 1, it is the sun that precedes the Earth and out of which the Earth is eventually drawn, whereas the normal reading of the Hebrew text as well as the Greek Septuagint translations, insist that Earth was created first, by itself, and was surrounded by a sphere of water in total darkness, and the sun was not created until the fourth day. Even the "light" of Genesis 1:3 does not appear until after Earth is given its name and put in its primeval condition. According to the *Biblia Hebraica Stuttgartensia's* textual notes, there are no significant differences among the major manuscripts in these opening verses of Genesis. Not until Gn 1:7 is there the slightest discrepancy among the various manuscripts.[935]

In Crombette's Coptic version of Genesis 1:1-2, it is reported by him to say:

> God who at the beginning…made through his Word, the system which is suspended in a circular movement around the heavens, then the system maintained below, the Earth, taken from the sun. The Earth coming from its taking out of the sun, was then constituted in the general form of a globe: it lacked boundaries…*etc.*[936]

Without giving the reader any indication of the critical textual apparatus he is using, or any indication that he might have reservations about this seeming bizarre translation, Crombette produces a text that is almost the total antithesis of the Hebrew text, and probably less accurate than the Babylonian epic *Enumu Elish*. It is difficult to know what may have been driving Crombette to undermine the traditional inspired Hebrew text to the extent represented above, as well as to ignore all previous translations of Gn 1:1-2.

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[935] E. Elliger et W. Rudolph, Textum Masoreticum curavit H. P. Ruger, Gedruckt mit Unterstützung der Deutschen Forschungsgemeinschaft 1967, 1977.

[936] *If the World Only Knew: Fernand Crombette, His Life and Work*, pp. 306-307.

All we have from Crombette's book that purports to be a synopsis of his translational methodology are a few pages of interpretive principles that he sought to apply to the Coptic text. For example, Crombette insists that Coptic should be "read in monosyllabic Coptic" and that the "Coptic language suffered from deformation rendered necessary by the technique of the rebus," and that, "The general sense of the phrase indicated what should be read."[937] Be that as it may, the fact that the author admits the Coptic language "suffered from deformation" should have been the first warning sign that Coptic was not reliable. In fact, Crombette himself suggests the dubiousness of his whole approach as he admits that the original Coptic language was written in "hieroglyphics" and only later into letters. (NB: the very name CESCHE is an acronym formed by Crombette's translation of a hieroglyphic from an ancient rebus.)[938] How he arrived at the conclusion that this primitive set of picture-words, which he admits incurred a "deformation," could ever be expected to give us an accurate picture of the first days of Genesis is quite puzzling.

The only comment Crombette offers to his reader concerning the Hebrew language is that it lacked precision because it "had no vowels," and thus could leave "doubt of the sense of the words."[939] Although there is some truth to this, Crombette's concern is more of an exaggeration than a cause for alarm. In actuality, (and Crombette admits this himself) the Jewish scribes and their meticulous preservation techniques retained the precise meaning of the text by memorizing the vowel sounds of the consonants, from generation to generation. This is precisely why the Masoretic text is so accurate and agrees almost word-for-word with the Greek Septuagint in the text of Genesis 1.

Furthermore, even without the vowel sounds, the Hebrew language is somewhat limited in the meanings available for its tri-consonant-rooted words (*i.e.*, most Hebrew words are based on three consonants). Granted, there could possibly be two or three different meanings available to the root word without vowel markings, still, the correct meaning could very easily be determined by noting the context of the passage, not to mention the confidence a Hebrew scribe would possess by his total familiarity with the language, written as well as spoken.

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[937] *Ibid.*, pp. 142, 145-146.
[938] *Ibid.*, p. 147.
[939] *Ibid.*, p. 177.

Jerome, who of all the Fathers was one of the few who knew Hebrew and probably had at least some Hebrew manuscripts at his disposal when translating the Old Testament into Latin, and who possessed the various Greek translations of the Old Testament, gives absolutely no indication that a manuscript or translation along the lines of Crombette's rendition of Genesis 1:1-2 existed anywhere in the world. Augustine, who worked with the Septuagint text of Genesis, also offers nothing close to Crombette's translation or interpretation, nor does either Basil or Chrysostom (the principle patristic exegetes of Genesis 1-2).

One wonders, for example, how the word "sun" even entered the Coptic rendition Crombette claimed for Genesis 1:1-2, since the Hebrew scriptures not only avoid using the word "sun" שׁמשׁ (*shemesh*) until Genesis 15:12; but even the word "light" אוֹר (*or*) isn't mentioned until Genesis 1:3. Moreover, even without vowel-pointing in the original Hebrew text, there is nothing among the rudimentary Hebrew consonants of Genesis 1:1-2 that is close in lettering or syllabic pronunciation to *or* or *shemesh*, and thus there was little, if any, possibility for confusion or imprecision in the original text of Genesis 1:1-2. There was certainly nothing close to what Crombette produced from his Coptic sounds.

It is quite apparent that, despite Crombette's choice of title for the book he wrote on this subject, namely, *La Genèse, cette incomprise* (translated: "Genesis misunderstood"), it appears that Crombette himself has grossly misunderstood the Genesis text. Perhaps not knowing any better than Crombette, the biographer, Noël DeRose, insists that "the translations produced by Crombette in no way alter the known texts of Holy Scripture" but merely give "interesting scientific details and complementary information, such as logical explanation…" Yet it should be clear to any biblical scholar who is familiar with the original languages of Scripture; the history of manuscript transmission; the traditional meaning of Hebrew and Greek words; and the overall sense of Holy Writ, that Crombette did precisely what DeRose insists that he did not do. Rather than helping us, they should be highly concerned that Crombette's interpretation somehow missed the insight of holy men of God for 4,000 years until we were blessed to receive it from his Coptic pen. That humankind has totally misunderstood a basic text of Scripture for four millennia doesn't seem to bother Crombette in the slightest, however.

Finally, Crombette's translation of Genesis 1:1-2 is not, as he claims, "scientific." There is no scientific evidence that the Earth came out of the sun, much less has any patristic or ecclesiastical source ever suggested that it was the proper interpretation of Genesis 1:1-2. And although there may be some scientists who have proposed that the moon came from the Earth, this is at best considered a hypothesis in order to support evolutionary theory, not to mention that Genesis 1:14-19 indicates quite clearly that the moon, as well as the sun, were placed in the sky by divine *fiat*, within one day, not, as DeRose proposes: "And certainly, one must believe in a Creator who made the Earth turn 17 times faster than in our days, so that it could eject the moon, and who then brought the Earth back to its initial speed."[940] Scripture does not even suggest such a scenario, let alone that we "must believe" it to be so. In the end, Crombette's theory that: (a) the Earth moves slowly through space, and (b) the Earth rotates on its axis instead of the sun revolving around the Earth, must be rejected for the simple reason that the Church was clear in 1633 that to deny the sun revolved around the Earth was "formally heretical" and to state that the Earth moved, whether rotating, revolving or moving linearly at a slow pace is "at least erroneous in faith," if not formally heretical.

This critique of Crombette's work is not to say that everything in his voluminous writings is erroneous; quite the contrary. Crombette's understanding of Pangea, for example, seems very plausible. In fact, it is supported well by the biblical and scientific evidence.

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[940] *Ibid.*, p. 306.

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